

Instructional Psychology

In Two Volumes, Volume 1

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Preface

The present volume provides a survey of the facts and principles of educational psychology which, in the opinion of the authors, will be of most value to students preparing for the teaching profession. As is explained in Chapter 1, this treatment of educational psychology is different from a statement of the familiar "principles of general psychology" and suggested "applications." The present volume is the result of an attempt primarily to offer material which will help the teacher to see his professional activities with deeper insight and in broader relationships and to carry forward his work with more competence and satisfaction.

Certain objectives were followed for the purpose of making the book of the greatest possible professional value. In the first place, it was agreed that the most important problems of education should be brought forward and grappled with in the light of the findings of educational psychology even if the data were not as yet very extensive. Contrariwise, other issues would be omitted or minimized even if the experimental findings were very extensive and final. Thus, for example, the processes of acquiring meanings, of generalizing, thinking, and problem solving, and the problems of curriculum organization in the school studies and other areas are given far more attention than the principles of economy in rote learning.

It was agreed that the text should represent a candid statement and critical evaluation of available information. We have accordingly attempted to avoid exaggerating the practical values of the psychologist's devices, such as personality or intelligence tests, or the finality of the experimental evidence concerning various issues, such as the subject matter

versus integrated curriculum controversy. We have endeavored, furthermore, to produce a text in which personal bias is reduced to a minimum.

Each chapter contains a fairly extensive list of "References Cited in the Text." Care was exercised to include in each list references to a substantial number of representative investigations. This list should help the instructor introduce his students to a sampling of the important experimental studies upon which educational psychology is founded. The instructor will, of course, decide which of these to report in greater detail himself and which to ask the students to read.

Each chapter contains a group of "Questions and Exercises" for the students. These are designed primarily to foster critical thinking about the content, and applications of the data to various practical and theoretical situations. At the end of each chapter is also a list of briefly annotated references for further reading. In the main, this list contains titles of more comprehensive treatises on the various topics presented in the chapter. The guidance of the instructor concerning the kind and amount of supplementary reading to do will doubtless be appreciated by the students.

Certain other characteristics and purposes of this text are discussed in Chapter 1 because they are believed to be important for the student. In Chapter 1, for example, it is suggested that the student need not wed any "system" of psychology and promise to "love, honor, and obey" it until death do them part in order to profit by study of the subject. It is suggested, furthermore, that if any student feels strongly inclined toward a tie-up with one system, it will probably be better for him not to accept the first one that presents itself, but delay a final choice until he has made more and deeper acquaintances. The student is warned, moreover, that, although the authors have done their best to give the most valid interpretations and applications of the results of available research, future investigations will doubtless show them to have been in error in some instances. For this and other reasons, they urge the students

to attempt not merely to learn the facts and implications of educational psychology as presented in this text but especially to try to learn how to interpret the results of research and apply them to their own problems in the future. In pursuing such a purpose, the instructor's guidance in using current investigations will be invaluable.

~ We hope—and believe—that this text will be useful to students in teachers colleges and university departments of education who have previously had a course in general psychology. As stated above, the primary purpose of this book is not to present all the facts and principles of general psychology but to bring the results of psychological research and theory to bear upon the major activities and problems of the teacher. Its purpose is primarily to help teachers increase their professional competence and learn to utilize the findings of psychological study in the years to come. The volume for this reason should be useful also to teachers in service, who wish to resurvey the contributions of educational psychology. Although the book may be studied without fear of “too much repetition” of the typical introductory text in general psychology, it should be understood without special difficulty by teachers and students who have not had such a course. The authors have endeavored to make the volume stand on its own feet by avoiding unnecessary ambiguities and technicalities, by defining and illustrating unusual but necessary technical terms, and by making the text as lucid and unified as possible.

Table of Contents for Volume 1

| CHAPTER | PAGE |
|--|------|
| INTRODUCTION· THE SCOPE OF EDUCATIONAL PSYCHOLOGY | 3 |
| Characteristics of Educational Psychology in the Past | 3 |
| Characteristics of Educational Psychology Today | 4 |
| The Province of Educational Psychology | 9 |
| Relation of Educational Psychology to Schools or Systems of Psychology | 11 |
| Questions and Exercises | 14 |
| General References | 15 |
| II. THE DEVELOPMENT OF BEHAVIOR: INTRODUCTORY | 17 |
| Behavior at Birth | 17 |
| Some Characteristics of the Course of Development of Behavior | 20 |
| Learning and Growth | 23 |
| Maturation and Training in Relation to Mental Operations | 32 |
| Some Further Characteristics of the Development of Behavior | 35 |
| Summary | 40 |
| Questions and Exercises | 43 |
| General References | 44 |
| References Cited in the Text | 45 |
| III. PHYSICAL AND MOTOR DEVELOPMENT | 48 |
| Growth in Height and Weight and Bodily Proportions | 48 |
| Motor Development | 54 |
| Interrelations of Motor Abilities | 63 |
| Relation Between Mental and Motor Abilities | 64 |
| Motor Development and Play Activities | 66 |
| Summary | 73 |
| Questions and Exercises | 76 |
| General References | 78 |
| References Cited in the Text | 79 |

| CHAPTER | PAGE |
|--|------|
| IV. EMOTIONAL DEVELOPMENT | 82 |
| Anger | 91 |
| Fear | 95 |
| Pleasure | 103 |
| Affection | 109 |
| Laughter and Humor | 111 |
| Summary | 112 |
| Questions and Exercises | 116 |
| General References | 118 |
| References Cited in the Text | 119 |
| V. DEVELOPMENT OF SOCIAL BEHAVIOR | 122 |
| Individual Differences in Social Response | 131 |
| Relative Potency of "Positive" and "Negative" Social Responses | 138 |
| Sympathy | 139 |
| Friendship | 142 |
| Resistant and Aggressive Behavior | 145 |
| Competition | 148 |
| Leadership | 151 |
| The Effect of Various Educational Procedures on Social Behavior | 155 |
| Summary | 159 |
| Questions and Exercises | 164 |
| General References | 166 |
| References Cited in the Text | 167 |
| VI. MENTAL DEVELOPMENT | 173 |
| Sensory and Perceptual Development | 177 |
| Memory | 181 |
| Capacity for Sustained Attention | 184 |
| Language Development | 185 |
| Contents of Conversations and Discussions at Various Age Levels | 192 |
| Development of Concepts and Reasoning | 193 |
| Daydreams and Dreams | 205 |
| Moral Concepts | 213 |
| Summary | 215 |
| Questions and Exercises | 218 |
| General References | 220 |
| References Cited in the Text | 221 |

TABLE OF CONTENTS

xi

| CHAPTER | PAGE |
|---|------|
| VII. THE NATURE AND MEASUREMENT OF INTELLIGENCE | 225 |
| Typical Tests of Intelligence | 225 |
| Mental Age and Intelligence Quotient | 233 |
| Statistical Analyses of the Nature of Intelligence | 234 |
| A Preliminary Definition of Intelligence | 236 |
| Influence of Nature and Nurture on Individual Differences in Intelligence | 238 |
| Summary and Conclusions | 250 |
| Questions and Exercises | 252 |
| General References | 253 |
| References Cited in the Text | 254 |
| VIII. THE PRACTICAL USES OF INTELLIGENCE AND OTHER APTITUDE TESTS | 256 |
| The Range of Individual Differences in Intelligence | 256 |
| Intelligence and Scholastic Achievement | 258 |
| Intelligence and Particular School Subjects | 262 |
| Intelligence and Vocational Success | 263 |
| Intelligence and Social Adaptability and Leadership | 267 |
| Intelligence and Moral Adjustments | 268 |
| Conclusions | 270 |
| Special Abilities and Disabilities | 271 |
| Prognosis Tests | 277 |
| Summary | 281 |
| Uses of Intelligence Tests and Aptitude Tests | 282 |
| Questions and Exercises | 291 |
| General References | 293 |
| References Cited in the Text | 293 |
| IX. THE GENERAL NATURE OF LEARNING—I | 295 |
| Needs and Opportunities for Learning | 296 |
| Definition of Learning | 299 |
| Learning and Maturation | 301 |
| Process of Learning | 306 |
| Intent to Learn | 309 |
| Motivation | 311 |
| Summary | 318 |
| Questions and Exercises | 320 |
| General References | 322 |
| References Cited in the Text | 322 |

| CHAPTER | PAGE |
|---|------|
| X. THE GENERAL NATURE OF LEARNING—II | 324 |
| An Outline of the Learning Process | 324 |
| The Law of Effect | 327 |
| Learning as Goal-Directed Activity | 328 |
| Insight | 331 |
| Organization in Learning | 335 |
| Differentiation and Integration | 337 |
| The Importance of Relationships | 340 |
| Summary | 341 |
| Questions and Exercises | 344 |
| General References | 346 |
| References Cited in the Text | 347 |
| XI. PRINCIPLES OF GUIDANCE IN LEARNING—I | 349 |
| Principles of Guidance in the Acquisition of Skill | 350 |
| Essentials for Continued Improvement of Skill | 357 |
| The Value of Verbal Methods of Tuition | 362 |
| The Learning Curve | 364 |
| Summary | 372 |
| Questions and Exercises | 373 |
| General References | 375 |
| References Cited in the Text | 376 |
| XII. PRINCIPLES OF GUIDANCE IN LEARNING—II | 377 |
| Principles of Guidance in the Acquisition of Verbal | |
| Abilities | 377 |
| The Influence of Success or Failure | 394 |
| Retention after Verbal Learning | 404 |
| Summary | 416 |
| Questions and Exercises | 418 |
| General References | 420 |
| References Cited in the Text | 420 |
| INDEXES | 425 |

Educational Psychology

CHAPTER I

Introduction: The Scope of Educational Psychology

CHARACTERISTICS OF EDUCATIONAL PSYCHOLOGY IN THE PAST

Educational psychology has developed rapidly during the past two decades. The nature of this growth would be apparent to anyone who compared with the present book a volume called *Psychology for Students of Education*, written in 1922 by one of the present authors (Gates). The student may be interested to read a couple of the introductory paragraphs in the older book. Following is the opening passage which sought to indicate the value of general psychology:

By the use of methods similar to those employed in the natural sciences, psychology attempts to solve many of the problems concerning human behavior which have long been treated in less exact fashion. Teachers, physicians, lawyers, preachers, business executives, in fact, people in all walks of life attempt to understand, as best they may, by observing their own impulses, feelings, thoughts, and acts, as well as the behavior of others, the general characteristics of human conduct, and the peculiar traits of particular individuals. As a result of our observations, most of us have acquired notions concerning the motives which may be relied upon to stir us or others to action, concerning the acts and situations which please and displease, concerning the signs by which emotions and thoughts are made manifest. We have acquired methods of estimating traits of character such as honesty, sociability, ambitiousness, and traits of mind, such as alertness, depth, and sagacity. We have convictions concerning the relative mentality of men and women; concerning the temperaments of negroes and whites; concerning the learning capacity of children and adults. We have beliefs about the influence

of the weather, fatigue, or coffee upon efficiency in thought or skill. Long the subject of ordinary speculation, these problems and many similar ones when attacked by scientific methods constitute psychology.

This paragraph about the nature of psychology might be used as a preface to a current text in "general" psychology, but the following paragraph from the same book is definitely out of date as a description of the character of educational psychology.

In a Psychology for students of education most of the laws and principles which constitute General Psychology will be utilized. Of the innumerable particular facts gathered in the several branches of the science, many of them — of use to the physician, the lawyer, the advertiser, the salesman, the musician, or other people — are of relatively little importance for the student of education. The following chapters will include those principles and many of the particular facts from psychology (and many borrowed from other sciences, as well) which seem to have the most important bearing on education.

The implications of this passage are worth noting. First, note the implication that the earlier book offered chiefly the applications of the *principles* of *general* psychology to education, and certain detailed facts and experiments from psychology, which should prove illuminating to the teacher. The second is the correlated suggestion that educational psychology consisted of little more than such applications and data, and that it had no subject matter or area of operations of its own. The third is the suggestion that the really distinguishing feature of the data reported in the volume was the method employed in developing them. The book was considered to be a report of the educational implications of data gathered by *scientific method* as employed by psychologists.

CHARACTERISTICS OF EDUCATIONAL PSYCHOLOGY TODAY

A Critical Attitude toward Application of General Principles. The two decades that have passed since these

two paragraphs were written have produced marked changes in educational psychology. In the first place, it may be said that although the principles of general psychology are drawn upon extensively and frequently "applied" to education by figuring, mentally, what they would probably mean in educational practices, there is now an extensive literature describing the results of actual experimental tryouts of the suggested applications. In many instances, moreover, it has been found that the applications did not work out very well. As a result, we now consider very critically all statements that a psychological principle applied to this educational situation means that we do so and so. Especially is this true of the many applications made by psychologists and others whose acquaintance with school objectives, practices, and methods is rather casual.

Applications Themselves Must Be Subjected to Experimental Test. The sophisticated educator now wants to be shown. In this respect, he is like the shrewd physician who frequently hears how a suggested practice, derived from some principle or fact, would probably work. Large doses of a certain vitamin, said a biochemist some years ago, would probably increase assimilation and stamina greatly. The better physician waited for a test of the idea, first on animals and then on human beings, before feeding large doses of this vitamin to his patient. Later another biochemist said that large doses of vitamin B would probably greatly increase the learning ability of many children. The modern educator waited for a demonstration. As this paragraph is written, one of the writer's students in educational psychology is in the midst of an extensive experiment designed to test this possibility. Thus, today there is wide recognition of the importance of determining the validity of the application of general principles to educational practice. Educational psychology assumes a large responsibility for this function of trying out, experimentally, the application of general psychology to education. A large and important literature of reports

of such tests has already been accumulated, and extensive enterprises are now under way.

Educational Psychology Now a Field of Specialization.

Educational psychology is, however, not confined to the verification of applications of principles to education. It has built up in several areas programs of study of educational problems which general psychology does not deal with in any comprehensive way. Such areas as the teaching of the school subjects, and especially the conducting of the newer types of activity programs and projects, the diagnosis and remediation of educational difficulties; the newer types of evaluation of educational attainments; the improvement of practices in nursery school, adult education, and educational guidances — these are examples of fields of specialization for educational psychologists. These are fields that general psychology touches in only a limited way.

The Practical Viewpoint in Educational Psychology.

Both in trying out the implication of principles of general psychology and in investigating other problems in education, the educational psychologist adopts a special, professional point of view which differs somewhat from that characteristic of the general psychologist. The latter typically directs his investigations to find or verify a general hypothesis or principle. The former is often chiefly concerned with the task of finding or verifying a practical solution to a problem. In the case of the psychologist, the purpose is to build up a body of general scientific principles. In the case of the educational psychologist, the purpose is to develop professional practices of maximum value. To illustrate: the writer once asked a general psychologist, who had spent many years in productive research, to give his opinion concerning certain practical applications of his theories to certain educational practices. He replied that he could not express an opinion since he had not as yet given his attention to practical applications. On the other hand, the writer once asked an educational psychologist, who had made many studies of the teaching of a school

subject, what bearing his findings had on certain hypotheses in the psychology of learning. He replied that he had not as yet thought the matter through.

These illustrations, however, picture the extremes. Some general psychologists are extremely "academically minded," and some educational psychologists are extremely "professionally minded." There is no objection to such specialization if the extremists themselves and others, too, recognize their unique strengths and limitations. It is, however, very important that a sufficient number of competent persons be active in bridging the gap between the general theories and the professional practices. The educational psychologists, at least many of them, should attempt not only to find the best professional practices but also to see clearly the bearing of their results on the general theories. General principles can often be derived as validly, or even more validly, from studies conducted in genuine educational situations as from research conducted in the more artificial and restricted settings of the laboratory of general psychology. The typical defect of the laboratory is the oversimplification of the situation resulting from efforts to secure better control; the typical defect of the natural school situation is the obscurity of the main principles by the complexity of the practical setting. In the long run, both types of attack are desirable. If the professional suggestions contained in the academic studies and the theoretical implications of the professional investigations are carefully and skillfully extracted, both general theory and professional practice will become more meaningful.

A Suggested Attitude toward Principles. In this case, the policy most useful for the investigators is a desirable one for the student to adopt. He should, in other words, try to learn to see the practical educational implications of various general theories and principles and the theoretical implications of demonstrated differences in results arising from various practices. A major purpose of this book is to help the student acquire such skill and insight. The volume will

present many general principles and theories and suggest their educational implications. It will give special attention to cases in which suggested implications have been put to the test by special experiments set up for this purpose. It will also review the results of many experimental studies of professional practices, especially those in which two or more procedures are compared, and attempt to point out the bearing of the results on the validity of general theories and principles as well as upon particular practices in the daily work of the schools.

Learning to Evaluate and Use Reports of Research. In this way it is hoped that the student will acquire not only a fund of information concerning the best practices and the general theories underlying them but also, and especially, greater skill in interpreting both types of data. In the course of a professional life, the latter will probably prove to be more important than the former. Skill in interpreting the results of all types of studies, ranging from those extremely theoretical in design and purpose to those extremely practical, will provide the means of utilizing the results of research in later years. Keeping abreast of later research will clarify much that is now obscure, open up areas now barely touched, and, no doubt, yield true interpretations to replace many erroneous conclusions now tentatively or even confidently accepted.

There are doubtless many statements in this book which will bring blushes of embarrassment to any one of the writers who reads them twenty years hence. This is inevitable. On many matters of theory and practice we must now make statements on the basis of insufficient data and, needless to say, we are far from omniscient. A vigorous science, such as educational psychology now is, moves very rapidly, and new developments, many of them unforeseen at present, are certain to occur. The business of the student is to learn how to keep abreast of them. Study of this book, it is hoped, will help the student achieve this purpose.

THE PROVINCE OF EDUCATIONAL PSYCHOLOGY

As a definitely recognized field of specialization, educational psychology has only a short history. Many persons think of it as **beginning** with the appointment of Edward L. Thorndike, Charles H. Judd, Lewis M. Terman, and others to definite university posts to cultivate the field. These men began their work in the field shortly after 1900. Although it took these exceptional pioneers little time to get going at full speed, it required considerable time for so few of them to explore even the major areas in education. Only since about 1920 has educational psychology begun to take very definite form, and its province is continually changing as the result of the development of new concepts and tools within the science and the appearance of new objectives and needs in education. For example, the discovery by psychologists of the possibilities of education in the nursery school at the one extreme and in adult life at the other has added two new and vastly complex areas. Similarly, the recently developed conviction of educators that the schools must definitely teach children to live and love "the democratic way of life" has opened up a field of investigation as subtle as it is important. Thus, although educational psychology now embodies a number of well-recognized fields of operation, its boundaries are neither very definite nor stable.

Boundaries Uncertain and Changing. Writers of textbooks and teachers of college courses in educational psychology sometimes become a bit impatient with the uncertain boundaries of educational psychology and want to call a meeting to define the field. Such an enterprise could be of only temporary value if, indeed, it did not do more harm than good. It is probable that a meeting for the exactly opposite purpose, namely, to suggest new needs that should be met and new fields that should be entered, would be more fruitful. J. McKen Cattell, one of the great pioneers in psychology (whose work has contributed greatly to the development of

educational psychology), when asked to define psychology, said: "Psychology is what psychologists do" This characterizes, if it does not define, educational psychology. And no one knows what psychologists may do even in the next decade

Topics Covered in the Book. At the present time, the variety of problems investigated by educational psychologists are so numerous that they could not all be presented in a text twice the size of the present book. What is offered in this volume is a fairly extensive survey with emphasis upon the findings judged by the authors to be most important for the teacher. The reader can get a good idea of the topics covered, and, also, secure a notion of the whole report which will be beneficial in his later study by doing two things: first, by reading the table of contents a time or two and, second, by skimming the summaries and glancing at the titles of books recommended for further reading, both of which appear at the ends of the chapters. An hour or two spent "skimming" the entire book will probably also give the student a notion of the subject as a whole which would bring out more and richer relationships in later study than would be possible in a strictly piecemeal approach.

The student who examines the whole book in a preliminary survey will appreciate the wide range of topics covered in the field. The large number of books on special topics — child development from birth to six years; development from six years to twelve; development during adolescence; the psychology of adult life; the psychology of old age; the emotional life of the child; the psychology of social adjustment, intelligence testing; aptitude testing; achievement testing; vocational testing; the psychology of reading, of algebra, and many other special subjects; psychology and the curriculum; diagnosis and remedial work; personality development, clinical psychology; the psychology of the gifted, to name a few — suggests the task faced by the authors of a comprehensive text. The situation implies also the reason for having four authors join forces in preparing this text.

In developing this volume, each author wrote the material in a field to which he had given special attention for a period of years. Each of these is a rather broad field. They may be roughly described as:

1. Mental, physical, and emotional development from birth to maturity
2. The process of learning; thinking and reasoning, the art and technique of teaching, and problems of curriculum organization
3. The measurement of intelligence and special abilities; the diagnosis of special disabilities; and the appraisal and evaluation of the progress of learning.
4. Personality adjustment and development; the techniques of diagnosis and remediation of maladjustment, the problems of handicapped pupils; and the mental hygiene of the pupil and the teacher.

Although all the authors were familiar with all four areas, the fields are so specialized that, we found, any one of us could be easily caught off base in another's field. Each, however, reviewed as critically as was possible — or, shall we say, as critically as he dared — the first draft and the several revisions through which the material passed before reaching the publisher.

RELATION OF EDUCATIONAL PSYCHOLOGY TO SCHOOLS OR SYSTEMS OF PSYCHOLOGY

In educational psychology there are, as in general psychology, several general views or schools or systems. Behaviorism or Conditioned Response Psychology; Gestalt or Organismic Psychology; Connectionism or Stimulus-Response Psychology — these are familiar ways of referring to three systems or, more accurately, three groups of systems much under discussion at the present time. The four authors of this book were trained in different places and undoubtedly differ more or less in their attitudes toward the systems of psychology. That

none is very extreme is indicated by the fact that the book was finally finished. Ardent apostles of different schools of psychology could probably never finish a joint volume that they could all approve in detail. The authors, in the present case, were able to agree upon what is offered in the volume for two reasons. First, each viewed the various systems or schools as merely varieties of expression of general hypotheses and not as rival cults one of which must be accepted once and for all and defended to the death. Second, they feel that, as far as the professional applications are concerned, the differences between the schools are not very clear or very great.

This Book Is Nonsectarian. That the differences either in theoretical or practical implications of the several systems have been vastly exaggerated by the extremists was illustrated very well when a group of psychologists and educational psychologists under the chairmanship of one of the authors of this book, Dr McConnell, worked together for more than a year in an attempt to arrive at the real similarities and differences in theories of learning.* Insofar as the important professional applications were concerned, the more thoroughly the rival systems were examined the greater became the similarities and the less the differences. This is not to deny that there are differences in emphasis in the applications to education. The experiences of the four authors of this volume were similar. They found, in the end, that their views on all important matters were essentially in agreement — and they reached this happy state without any very serious casualties *en route*. This, however, does not mean that there are not differences among them in emphasis on several points. At first thought, this might seem to result in an un-systematic treatment of the subject. We believe, however, that is not un-systematic; it is merely nonsectarian. This book does not ardently espouse any one system of beliefs.

* *The Forty-First Yearbook of the National Society for the Study of Education, The Psychology of Learning*, Bloomington, Ill., Public School Publishing Company, 1942.

For two major reasons this book makes no attempt to present a complete, systematic discussion of the several schools of psychology. The first reason is implied in the preceding paragraph. For the professional worker, few important differences can be demonstrated. The second reason is that it is very difficult to present the various systems fully and clearly in brief form to readers who are not already quite familiar with the basal data of the science. Study of the systems is much more meaningful and profitable when the student is more advanced in psychology.

Several Schools of Psychology Cited. The present book, it is hoped, includes facts, principles, and applications in a form acceptable to persons with preferences for any one of the major systems. Certain distinctions among the theories will be considered in particular contexts which provide especially clear and useful illustrations. Thus something of the flavor of different points of view will appear without an effort to develop a complete systematic presentation.

The Choice and Use of Technical Terms. Educational psychology, like other sciences, has a technical vocabulary, that is, a number of terms each of which is used with a specific meaning. Although the various schools or systems of psychology have many terms in common, each system also has a number that are employed rather exclusively. There are, in fact, some instances in which certain words are used in two or more systems with somewhat different meanings and a larger number of cases in which essentially similar ideas are expressed by quite different terms. This situation raises certain difficulties for the student engaged in reading books or articles written by the representatives of different systems. The authors of the present volume have tried, in the choice and use of technical terms, to make understanding of the book as easy and clear as possible and at the same time to contribute to the ease and clearness of reading other books. A few words about the method adopted may be given together with a hint or two for the student.

In the first place, the authors have selected the terms that seemed to them most clearly suggestive or descriptive of the fact or principle or situation they were trying to present. An effort has been made to avoid those terms which tend to give misleading implications to the student or which are devoid of helpful clues. As a consequence terms that originated in different systems appear. In certain instances, especially in the second half of the book, mention is made of terms, other than those chiefly used in this book, that are commonly used in other books or systems. If this policy is carried out well, it will enlarge the student's vocabulary with a minimum of difficulty. It should make the reading of other books, such as those recommended in the lists at the end of each chapter, more easygoing. It should give the student a considerable familiarity with the most essential technical vocabulary of all the major theoretical systems. And here is a suggestion for the student.

As you read this text, take a careful look at the terms when several words or phraseology with similar meanings are presented. Make a game of comparing them and keeping them in mind. It will help you not only with this book but with other readings in psychology and related fields. Prominent writers and speakers in education, for example, make considerable use of the technical expressions of psychology. That some of them, alas, use them with meanings all their own makes it no less important to know in advance what the proper meanings are. To master some of the technical terminology and phraseology commonly used in psychology and educational psychology, as well as the facts, principles, and methods, is to become equipped with tools essential for constructive work in one's professional career in education.

QUESTIONS AND EXERCISES

1. Why is there always a degree of uncertainty in "applying a principle" established in a laboratory experiment to actual classroom situations?

- 2 Does the chapter imply that there is more or less scientific study of educational problems now than there was twenty years ago?
- 3 In many psychological experiments the method of learning a poem as a "whole" has proved more effective than learning it "piecemeal" Does this mean the "whole" method of learning should be used in learning all types of material in school? Why?
- 4 Formulate two problems which would lie directly in the field of specialization of the educational psychologist rather than in that of the academic psychologist
5. Do you believe that the science of chemistry is divided into opposing "schools" of chemistry? Why do you think we have "schools" of psychology?
- 6 Why is it probably easier to understand the various schools or systems of psychology after one is familiar with the main data of the science than it is before these data are known?
- 7 What evidence for the growth of adult education have you observed? How do you account for this growth?
- 8 Criticise the following conclusions in the light of scientific methods.
 - a A man asserted that women are emotionally unstable because his sisters are more often "upset" than he is
 - b. The fact that college graduates earn larger salaries at forty years of age than persons of the same age who did not go to college proves that a college education increases one's earning power
 - c The fact that the best reader in the class was taught by the phonetic method proves that this method is better than that applied to any other member of the class.
 - d The fact that the oldest living inhabitant of the state has smoked since he was fifteen years old proves that smoking increases the length of life
9. What, if any, are the distinctions between an hypothesis, a theory, a law, a principle? What is the difference between a scientific law and a civil law?

GENERAL REFERENCES

A good discussion of the development of scientific study in education will be found in F. N. Freeman *et al* , "The Scientific Movement in Education," *Thirty-Seventh Yearbook of the National Society for the Study of Education*, Part II, Public School Publishing Company, Bloomington, Ill., 1940 An interesting discussion of "applied psychology" in comparison with "pure" psychology appears in

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CHAPTER II

The Development of Behavior: Introductory

A child's education begins as soon as he is born. His first curriculum consists of the ways in which he is handled, his schedule of feeding and routine care, the contacts, sights, sounds, and other sensory stimuli that impinge upon him. Many of the experiences that play a part in shaping his habits and attitudes arise incidentally, without plan, in the course of his daily care. But from the very beginning his parents, who are his first teachers and whose influences upon the child are likely to outweigh the effects of any later instructor, make many practical decisions that affect his everyday experiences and his opportunities for learning.

As the child's abilities mature the provisions made for his education increase apace. To be most effective, his education throughout the course of his development must be adapted to his own ways of growing and learning. For this reason, the study of mental, motor, and emotional development is of primary concern to educational psychology.

The immediately ensuing discussion will deal with various aspects of development. A section will deal with some of the characteristics of the child at birth and the general nature of changes following birth. Later sections will deal with motor, emotional, and social development and with the growth of mental abilities.

BEHAVIOR AT BIRTH

The child is capable of behavior long before the day of his birth, or before his expectant mother is conscious of his

stirrings. Much has been learned concerning the prenatal behavior from the study of infants who, by some mischance, have been delivered before normal term. The beating of the heart has been noted for the first time at the end of the third week of prenatal life. The processes involved in respiration and digestion are prepared to function several weeks in advance of the time of normal delivery. At about the third month of prenatal life many activities involving the skeletal muscles have been noted, and the range of such activities increases during ensuing months¹

These early movements of the skeletal muscles are under the control of "subcortical" centers in the nervous system — the spinal cord and brain stem as distinguished from the cerebrum. The higher brain centers, which eventually play so important a role in human behavior, are relatively backward in their development. During the later months of prenatal life there is evidence of the beginning of the functioning of the cerebral hemispheres, but at the time of birth these structures are as yet undeveloped as compared with the "lower" centers, and are not functioning appreciably in relation to many performances in which they eventually will participate²

"Mass Activity" and Generalized Response. A notable characteristic of the behavior of the infant during the first days of life is the occurrence of a vast amount of seemingly diffuse activity. Movements of the arms, legs, trunk, and head, often combined with crying, may be so rapid and profuse that an observer is quite unable to note them in detail. The term "mass activity" has been used to describe such movements.³

Likewise, even the activities that appear to be quite well established at birth may be less clearly defined than will be the case at a later time. For example, the healthy child can do a good job of sucking, but sucking movements will occur not only when an object is placed in contact with the baby's lips, but also occasionally in response to other stimulation, such as pulling the infant's hair or pinching one of his toes.⁴

In observations of children during the first days of life it has also been noted that a stimulus applied to almost any part of the body may produce a response in almost any other part of the body. But this does not mean that all is confusion. Even from the start, for example, some activities are more clearly demarcated than others. Moreover, movements are likely to be most marked in the parts immediately affected (as in the leg when the foot is pinched), or in a part already set to respond (as when the child, with a nipple already in his mouth, resumes sucking when his foot is pinched).

The Mental Life of the Newborn Child. Many theories might be raised concerning the nature of the child's impressions during the first days of life. James, a famous psychologist, opined that "the baby, assailed by eyes, ears, nose, skin, and entrails all at once, feels it all as one great, blooming, buzzing confusion."⁵ On the other hand, it has been claimed that the child is capable from the start of rather definite "psychic" experiences; that the rigors of birth have a profound effect upon him, that strong emotional impulses such as fear, rage, and love are there from the beginning. Such conjectures, however, cannot be accepted as established fact. We have no direct way of finding an answer to the question, "What is going on in the child's mind?" but some points may be noted. The very fact that the child is equipped to respond (although not in the manner of an older person) to stimuli that come to him by way of the sense organs of sight, hearing, taste, and cutaneous contact suggests that the beginnings of impressions of some sort are being established. In conjecturing as to what these impressions may be, we must, however, take into account many limitations that characterize the child. As far as vision is concerned, for example, he is capable of only fleeting regard for an object, and it will be many weeks before the ability to fixate and follow a moving object will be fully established. The fact, as noted above, that a sensory stimulus is likely to set off a good deal of generalized response suggests that impressions from the various sense

organs are not as clearly demarcated as will be the case in time. Further, whatever may be the nature of the child's experiences, they cannot have the same meaning as will be attached to them in time, for the child definitely lacks the background of experiences against which the impressions that flow in upon an older person are defined and interpreted.

SOME CHARACTERISTICS OF THE COURSE OF DEVELOPMENT OF BEHAVIOR

In the course of development during prenatal life and after the time of birth, certain general characteristics can be noted. Some of these will be discussed in the immediately ensuing paragraphs. Other general characteristics will be discussed in succeeding chapters.

Progress from Generalized to More Localized and Specialized Behavior. As already noted above, one characteristic that can be observed in the development of behavior is the advance from generalized to more specific forms of response. This phenomenon can be observed not only in early infancy, but it may also appear at a subsequent stage of growth. During the first days of life, for example, a pinch on the leg may produce not only a movement of the affected limb, but also movements in other parts of the body. As time passes, response to a similar stimulus (unless it has a startling effect) is likely to be restricted more to the affected limb.

Illustrations that parallel this, in one manner or another, could be multiplied almost indefinitely. In an extended series of observations of the response of infants to a pin prick, for example, the following succession of responses were observed: ⁶ In the "newborn" phase, the response (when it first occurred; some children do not respond during the first hours or days of life to a pin prick of a given intensity that will produce a response later on) consisted of diffuse bodily movements accompanied by crying and sometimes by reflex withdrawal of the affected part of the body. Succeeding this there was a

period during which there was noticeable diminution in the diffuse movements, without signs, however, of ability to identify the affected part of the body. In the next phase, it was observed that the infants began to localize, within broad limits, the area where the stimulus was being applied. When the leg was stimulated, for example, there was a seemingly deliberate withdrawal of the leg from the source of irritation, as distinguished from an earlier form of reflex withdrawal. Succeeding this, there was evidence of a gradually increasing ability to identify the specific point of irritation, as shown, for example, by the fact that the infant brought his hand to the stimulated part (when the stimulus was applied in the upper region of the body) and, with the further passage of time, tried to rub the affected area or to push the offending stimulus away.

Individuation.⁷ In the foregoing we have seen that the process of differentiation may take the form of a dropping out of diffuse movements that originally occurred in connection with a given response. It may also take the form of differentiation of movements from previously more inclusive or "total" reactions. The term "individuation" has been used to identify this phenomenon. (See reference 7 and discussion, pp. 45-46.)

"Direction" of Development. Generally speaking, the development both of bodily structure and of bodily functions proceeds in a cephalo-caudal direction, or from the head tailward. Jackson and Scammon⁸ have pointed out that, while each part of the body "passes through its own cycle of changes, these changes on the whole tend to follow what is known as the *law of developmental direction*. for it is generally found that development (including growth and differentiation), in the long axis of the body, appears first in the head region of the body and progresses toward the tail region."

On the anatomical side, illustrations of this trend can be noted in the fact that during prenatal life the arm buds appear before the leg buds and that growth in the head region is in advance of growth and differentiation in the leg region

Simply from the point of view of size, the head at the time of birth is decidedly larger, in proportion to its mature dimensions, than are the trunk or the lower extremities.

The development of behavior shows roughly the same sequence. The child can raise his head before he can raise his chest. He is capable of quite skillful use of arms and hands before he can make much effective use of his legs or feet. This does not mean, of course, that development is complete in the upper regions or anterior regions of the body before it begins in the lower or posterior regions, but rather that the former tends to be in advance of the latter. A further illustration of this appears in findings (by the Shermans⁹) concerning pain sensitivity as shown in response to being prodded by a needle. During the first hours of life, it required fewer proddings of the skin in the head and neck region to elicit a response than was the case in the leg region.

Development also proceeds in a *proximo-distal* direction. generally speaking, this means that development in the part of the limb which is proximal, or next or nearest to the main axis of the body, takes precedence over the more remote or distal parts. For example, voluntary movements involving the use of muscles of the upper arm appear before the child is capable of precise voluntary movements of the fingers such as are involved in picking up a marble with the thumb and forefinger.

Further illustrations of the foregoing principles will be noted in later sections. It may be pointed out, incidentally, that these principles have a bearing on practical rules which, in the past, have been accepted more or less widely in education. For example, the rule that training in motor skill should proceed, in general, from gross to more refined movements, from performances that involve "large muscle groups" to performances that involve "smaller" muscles, is substantially in keeping with the proximo-distal direction of development. However, when we take account of the cephalo-caudal direction of development it can be seen that it would be erroneous

to set forth a blanket rule to the effect that, up to a certain age or stage of development, activities involving gross coordinations should be the only ones included in the educational program. As a matter of fact, a child may be capable of, and quite interested in, quite delicate coordination in the use of his hands and fingers (as in manipulating a small object with his thumb and forefinger) while yet he is incapable of making relatively gross coordinations involving the lower limbs (such as propelling a tricycle).

LEARNING AND GROWTH

The foregoing brief account describes a few of the characteristics that can be noted in the development of behavior. Other general characteristics will be discussed in later sections. By way of introducing a more detailed discussion of various features of development, it will be well to consider two factors that operate in the development of behavior, namely, growth and learning. The most obvious evidence of growth appears, of course, in the increase in the child's physical dimensions, his height and weight, as he grows older. Evidence of learning can be noted whenever it is apparent that a child's behavior has been modified by virtue of past experience. Such past experience may have occurred through exercise that he undertakes more or less on his own accord or through the impact of the external environment.

In connection with many of the phenomena that appear in the course of development it is possible to make a pretty definite distinction between these two factors. Thus, granted normal care, a child does not *learn* to grow bigger: he just grows, so to speak, although his growth may indirectly be influenced by learned forms of behavior (such as unwholesome food habits) and by factors in his environment (such as the unavailability of an adequate diet). Again, when a child at three years talks English rather than French it is obvious that the particular language he speaks has not just grown but has been learned. In connection with many

features of the development of behavior, however, the distinction between the influence of growth and of learning is not so clear. Thus, although the child learned English as distinguished from French, the fact that he now is capable of talking at all, but could not do so several months earlier, is due in part to the factor of growth.

Distinction between Growth and Learning Often Useful.

This growth factor, including changes that have come about in the maturation of the nervous system since the time of birth, is not as readily discernible as the growth underlying an increase in height. Moreover, in the development of behavior, the factors of growth and of learning are so closely interrelated that it is not possible to make a clear-cut distinction between them. In the case of many features of behavior it is possible, however, to make a rough practical distinction between these factors. This distinction has much significance from an educational point of view in connection with habits and performances which a child's elders, through direct teaching or other means of stimulation, try to induce the child to learn in the course of his education.

As a homely example, we may note one rather important feature of the child's early curriculum, namely, the "training" he receives in bladder control. Some mothers begin this training as early as the third month and maintain that their children have acquired the "dry habit" during the daytime by the end of the first half year. However, until the child has reached a level of neural maturation at which he himself can participate actively in this feature of his early curriculum, the "learning" that takes place consists largely in his mother's learning to take account of the child's vegetative rhythm (and perhaps partly to control this rhythm). To the extent that this holds true, the "dry habit" is not the child's habit but rather a "habit" that is superimposed by his mother.

Concerning the role of maturation in determining the child's readiness to acquire bladder control there is evidence both from the neurological angle and from systematic observa-

tion of overt behavior. Studies by McLellan¹⁰ indicate that the part of the cerebral cortex that governs bladder control is not functioning as late as the age of six months. In a study by McGraw,¹¹ records were made of the eliminative behavior of infants during a period of several months. The records indicated that there were distinct phases in the attainment of bladder control, and these phases were not altered in two children who received systematic "training." However, the infants began to respond actively to training when it appeared, from various signs in the children's overt behavior, that the cerebral cortex was functioning in relation to this function. The age at which these evidences of neural maturation appeared ranged from nine to twelve months in the case of the babies included in the study. In discussing the optimum time to introduce toilet training McGraw suggests, on the basis of the observations in this study, that ". . . training be delayed until the child's general behavior indicates cortical participation in the act of micturition."

Early Signs of Learning. The fact that the kind of learning desired by the children's instructors in the study cited above did not occur until near the end of the first year does not, of course, mean that the children's behavior was not subject to modification in one way or another before that time or that a similar time sequence prevails in the case of other performances (such as the ability to execute voluntary reaching and grasping movements). As pointed out in an earlier section, various performances emerge or are established at different times. Further evidence of learning appears practically from the time of birth.¹²

Methods of Studying the Roles of Growth and Training. Although learning and growth are closely interwoven, there are several means of obtaining some indication of the influence of the growth factor as distinguished from influence of learning that comes through the child's own efforts to exercise his abilities or through opportunities for practice and training that are provided for him. One approach is to study the

sequence of the development of various forms of behavior in normal children. Another is to compare children who have a minimum of opportunity and stimulation with children in a normal environment. A further procedure is to compare the progress of children who have received special opportunities for exercise and practice with initially equivalent children.

Some Findings and Generalizations. Studies utilizing methods such as those described above have yielded a number of interesting findings at the infancy and preschool level and, to a lesser extent, at the later age levels. These findings provide the basis for certain generalizations that are discussed below, but some of the generalizations must be regarded as tentative and subject to modification as more evidence accumulates.

Evidences of the Importance of Neural Growth in Infancy. The growth factor obviously is the governing influence in connection with operations or abilities that definitely seem to depend upon progressive maturation of the nervous system. Thus, as suggested in an earlier paragraph, training in voluntary bladder control is not likely to "take" before the neural machinery for such control has developed. Other illustrations of this can be noted in the case of reflex responses that wane or give way to voluntary behavior in the course of the maturation of the higher brain centers. An example is the grasp reflex. For some time following birth a child involuntarily will grasp an object that is brought into contact with his palm, and if the object is a suitable one, such as a bar, he may be able to sustain his weight by clinging to it for several seconds. In time, this reflex gives way to voluntary grasping (including the ability voluntarily to release the grasp). This transition from forced to voluntary grasping apparently cannot be hastened by "training" in the form of stimulating the child to grasp an object over and over again during the early months of life.¹³

The Role of Maturation and Incidental Activity. Since our knowledge of the development of the cerebral cortex in

relation to the development of various abilities and performances is not complete, most of the available information as to the effects of maturation, as distinguished from exercise, practice, or training, has come through empirical observation or experimentation without specific reference to observed or inferred changes in the nervous system. One generalization that emerges from such observations or experimentation is that the establishment of basic coordinations involved in the development of locomotion and the use of the arms, hands, and fingers in reaching, grasping, and manipulation depends primarily upon the factor of maturation plus such incidental "practice" as the child undertakes on his own accord. Once these coordinations have become established, training or opportunities for learning play an important role in determining the repertory of skills that utilize them.

Let us consider first the influence of maturation and incidental "practice." In one study it was observed that there was little that mothers could do by way of coaching or encouragement to alter the sequence or rate of the developments leading up to the child's ability to walk alone.¹⁴ Further evidence concerning this point is provided in a study of the development of twin sisters, one of whom for a period of six weeks, beginning at the age of forty-six weeks, received special encouragement and opportunity to climb stairs and to manipulate cubes. At the end of this period it was found that the twins were substantially similar in their manner of handling the cubes. Likewise, the child whose access to the stairs was deferred speedily proceeded to climb the stairs unaided and soon did as well as the youngster who had access to them during the six preceding weeks.¹⁵

Findings such as these do not mean that the developments in question simply occur in a vacuum, devoid of influences of a kind that may facilitate learning. Even when he is restricted more than normally, or is denied coaching or encouragement, the child will, of course, be more or less active of his own accord. The factor of maturation is important, however, in

providing the structural basis for the activities involved in learning.

The Role of Growth and Training in the Development of Skills. The effects of opportunities for learning become important in determining the child's acquisition of specialized skills that involve these coordinations in one manner or another. As indicated above, special coaching or provisions do not materially accelerate the development of the postural and locomotor coordination involved in walking. However, to acquire locomotor skills such as roller-skating, riding a tricycle, or propelling a scooter, he at least needs special equipment. Similarly, special provisions for learning will not materially accelerate the development of a child's ability to oppose thumb and forefinger in a pincerlike manner. But in order to adapt this form of prehension to skill in using a pair of scissors, or in buttoning, or in handling the taw in a game of marbles, he again needs special equipment. Granted the necessary equipment and opportunity, accordingly, one child at a given age may possess proficiency in all of these performances, while another, whose earlier progress in locomotion and prehension was quite similar, does not.

Even so, the level of maturity at which the child will be interested and be able to profit from opportunities to learn varies in the case of different performances. Thus, in one study ¹⁶ it was found that a child was able to learn to roller-skate almost as soon as he was able to walk, but, although opportunity was provided, it was not until several months later that he was able to make any progress in riding a tricycle. Likewise, a child's readiness to acquire various manual skills mentioned above will be influenced not only by opportunities for practice, but by changes brought about in the process of maturation beyond the level when he first is capable of pincerlike prehension in manipulating objects with his thumb opposed to other fingers. This is indicated in a study by Hilgard ¹⁷ of two-year-olds which dealt with two of the manual performances mentioned above — buttoning and

cutting with a pair of scissors. At the end of a twelve-week period of "training," the trained children were superior to the children who had received no such help. During the thirteenth week, the latter group also received training. They made comparatively rapid progress and at the end of the week had almost overcome the advantage gained by the children who had received practice during twelve weeks. Developmental factors other than specific training in the performances in question had brought about increased capacity to profit from training.

Growth and Training in the Development of Speed and Precision. The factor of maturation also plays an important part in the development of increased speed and precision in a child's motor performances, and in the development of increased muscular strength. This generalization emerges from studies in which children who have received special encouragement and exercise for a time in various performances have been compared with control groups. In one such study, a group of children received exercise in a performance in which they were called upon to tap as rapidly as possible on a plane surface with an instrument held in the hand.¹⁸ In another study a group of children received instruction and exercise designed to improve upon their accuracy in keeping time to music while walking or beating time with their hands.¹⁹ In a third study,²⁰ children of elementary school age received exercise in the use of a dynamometer that measured strength of grip. In all of these studies, the performance of the trained children surpassed the performance of the untrained groups at the end of the period of special exercise, but the latter, in a relatively short time, overcame this difference.

These studies do not tell to what extent the groups might eventually have differed if the special exercises provided for one of them had been continued over a considerably longer period of time. But as far as the studies go, they indicate that the gains in capacity associated with maturation and such experiences as the children had in their everyday lives enabled

the control children, within relatively few trials, to achieve substantially the same level of performance as was reached by children who previously had exercised the performance during a period of several months.

Effects of Training Depend on Stage of Growth. The effects of training or of special opportunities for learning will be relative to the child's stage or phase of growth. As one feature of a larger study, one of a pair of twins received training in climbing an inclined board.²¹ He made quite remarkable progress, but his proficiency in climbing did not alter the underlying pattern of his mode of locomotion. When the climbing exercises began, he was using the creeping pattern, and his proficiency in climbing consisted in doing a better job of *creeping* up (involving the use of the toes to grip and push). In time, he progressed from the creeping to the walking pattern as his normal mode of progression, and his climbing pattern shifted accordingly: he now had to depend more upon his arms in pulling himself upward than upon his toes in gripping and pushing himself upward. The training he had received during the creeping phase did not carry over completely to the walking phase, although the child readjusted to the change and as the experiment went on continued to show an unusually high degree of proficiency in climbing.

Observations of the use children make of wheeled play equipment (wagon, carriage, tricycle, etc.) offer a further illustration. It was noted in one study²² that children living in prosperous homes, where much play equipment was available, were superior in many ways to poorer children who did not have the facilities at home with which to practice. However, the skills shown by the former group did not alter certain sequences that appeared in children's use of vehicles, such as a phase when the child's ability to use a vehicle was limited mainly to pushing and pulling, preceding a phase when he was capable of movements involved in propelling a vehicle.

Need for Readaptation of Early Skills to Changes Occurring in the Process of Growth. Coordinations that are ac-

quired at a given level of development are not carried over, intact, to a later level if there have been intervening changes in the underlying bodily structures and in the mechanics of the movements that are involved. The need for readapting a skill to changed bodily proportions is indicated in connection with a performance acquired by a child in one of the experiments cited above. This child learned to roller-skate almost as soon as he was able to walk, and was quite proficient in this skill at the age of two. When studied at the age of six, however, he did not have this skill in roller-skating. In the meantime, he had not practiced the performance. It appeared that without intervening practice and readaptation a skill that was acquired in relation to the bodily proportions of a two-year-old, including relatively short legs and a wide stance, did not carry over to the bodily proportions of a six-year-old, with longer legs and a relatively narrower stance ²³

The fact that such readjustments through continued or renewed practice may be required in connection with some performances does not necessarily mean, however, that the training undertaken at an earlier phase of growth is wasted. The changes that occur in the mechanics of a given performance are not likely to be so complete that there can be no carry-over whatsoever from one period of development to the next. Indeed (although there is not much systematic evidence on this point) it is likely in connection with many performances that the maximum level of proficiency will be achieved if they are practiced from the time when the child is able to undertake them at all. The value of such practice is illustrated in a practical way by the outstanding achievements of occasional individuals who began training in such activities as skating, tumbling, somersaulting, and other acrobatic performances at an early age and continued their efforts into mature years. Continuing practice, adapted to the individual's capacity at various levels of growth, not only seems to be helpful in influencing the particular skills that are involved but also in influencing the individual's attitude

toward a performance. For example, quite apart from the carry-over of skill that may be involved, a child who earlier has had the experience of climbing successfully is likely to continue to be more intrepid and self-confident in his reaction to heights even though there are some shifts in the manner of his climbing as he matures. Conversely, an individual who first undertakes a performance at a later stage of growth may encounter difficulties that might have been obviated by earlier training (we see this, for example, when an adult is unable to "let himself go" when learning to skate or turn somersaults).

In line with the foregoing it may also be noted that modes of behavior that are appropriate to a given level of development are not necessarily "habit forming" in the sense that they will block other modes of performance at a later level of development. There are distinct changes, for example, in the manner in which a child throws a ball as he grows older. The practice which he has in throwing in an "overhand" manner does not prevent him from learning other ways of throwing (unless, perhaps, the earlier mode of throwing is continued well beyond the time when he is capable of making the change).

MATURATION AND TRAINING IN RELATION TO MENTAL OPERATIONS

The foregoing statements have dealt with activities that are primarily motor in character. Later chapters dealing with social and emotional development will touch upon ways in which much the same circumstances in the external environment may produce different social and emotional responses at various levels of maturity. The role of maturation and such practice as a child undertakes on his own accord, as distinguished from special opportunities for exercise or learning, has also been studied in connection with performances that are mainly of an intellectual sort. The findings in these studies show many parallels with the findings in studies of motor

development, but the studies conducted to date are too limited in scope to provide the basis for extensive generalization.

The Age for Effective Training. One generalization that may be made (subject to certain reservations) is that a child's ability to profit from training or opportunities to exercise a given operation improves as he grows more mature. In the case of performances in which this holds true, a short period of training at a later age will yield as high a degree of proficiency as a longer period of training at an earlier age. This has been noted, for example, in studies in which training or exercises have been provided with a view to increasing children's competence in the use of language,²⁴ their memory span,²⁵ and their speed of naming colors.²⁶ In all of these studies, it should also be noted, the children who received earlier training did improve and were superior to matched control subjects at the end of the experimental period, so it is possible that if the training had been continued for considerably longer periods in the case of one group, and had been correspondingly deferred in the other, the former might eventually have reached a degree of competence that the latter would not later be able to equal. By reason of limitations in the available evidence we can only conjecture concerning this point, but from everyday observation it would appear that such a result may occur in some performances. There are, for example, certain accents and pronunciations in foreign languages that a person has difficulty in mastering as an adult but could have mastered if he had begun to use the language as a child.

Variable Effects of Training at Different Levels of Maturity. The foregoing statements emphasize the well-known fact that a child's readiness to profit from training or opportunities for learning at any given period varies in the case of different performances and skills. This generalization is quite obvious when considered in the light of widely separated intervals (no one, for example, would try to teach a one-year-old child how to play tennis), but it raises many

questions when considered in terms of the range of skills that might be appropriate at a given level of maturity. This does not imply, of course, that it would be possible, even if it were desirable and if complete information were available, to devise a detailed schedule of the activities or units of work that would be most strategic at each age or grade level. This is especially true in view of individual differences in ability and rate of development, the influence of habits and attitudes established in the past, differences in the quality of instruction that is available, and numerous other factors. But findings in studies in which special opportunities for practice have been provided, or in which work traditionally prescribed at one grade level has been deferred until a later time, suggest that the educational program might be much improved if more account were taken of the development of the abilities and interests of normal children.

One such study, which will be referred to in a later chapter, dealt with the development of children's understanding of chronology and concepts of historical time. It was found that sixth grade children who received formal training in history, supplemented by various devices designed to emphasize the concept of time, did not, at the beginning of the seventh grade, differ appreciably in their mastery of concepts of time from another group of children who had not received formal instruction.²⁷ In the process of growing older, and of acquiring such information as was provided through their everyday experiences, the latter group during the course of a year made as large a gain on the tests that were applied as did the former. In another study comparisons were made between pupils whose formal instruction in arithmetic was postponed until the sixth grade and pupils who were taught according to the conventional course of study.²⁸ It is reported that when the former children finally were introduced to the more formal (as distinguished from everyday and incidental) arithmetic, they mastered, in a relatively short time, arithmetical problems that pupils in the usual classrooms had

struggled with for a relatively long period of time in the earlier grades. On the other hand, some studies have shown that a child's ability to profit from opportunities to acquire certain other accomplishments may quite surpass conventional expectations. This has been noted, for example, in studies of the response of young children to training in singing.²⁹

Studies such as these do not provide any definite generalizations as to what performances may most appropriately be selected for emphasis at any given period. They suggest, rather, a need for more comprehensive investigations.

SOME FURTHER CHARACTERISTICS OF THE DEVELOPMENT OF BEHAVIOR

In the discussion so far we have noted the nature of some of the changes in behavior that take place as a child matures and some factors related to these changes. In addition, it is possible to note certain other general trends or characteristics in the development of behavior. Some of these are discussed immediately below. Others will be touched upon in later sections that deal with various aspects of motor, mental, and social development. The statements that follow should be regarded as broad, descriptive formulations rather than as laws or principles that invariably hold true.

Uniformity of the Sequence of Development in the Establishment of Basic Behavior Patterns. Although infants differ in their rate of progress and in their accomplishments at any given time, they show a high degree of similarity in the order in which different developments appear and are consolidated. This can be noted, for example, in the development of the basic coordinations underlying the ability to walk and in the succession of developments that eventuate in the ability to talk.

Perhaps the most notable illustration of uniformity in the succession of behavior changes in early life is provided by premature children. Such children, when they survive, must undertake certain operations, such as breathing and

obtaining nourishment through the digestive tract, that are demanded of normal full-term babies. But in some features of their behavior — their reflexes, postural attitude, and muscular tonus — they continue after birth to show many characteristics of the prenatal period of growth. They do not, by virtue of being born prematurely, suddenly “skip” a month or two or more in their development.

Interrelatedness of Various Aspects of Development. At no stage of development do mental, social, emotional, and motor aspects of behavior appear in “pure” form, but the interrelatedness of these aspects is especially prominent during early childhood. It is difficult to make a clear distinction between what might be called “mental” as distinguished from “motor” behavior during early infancy. Likewise, the child’s early *social* behavior is closely bound up with his *mental* development. For example, when the child sometime during the first two months or so responds by smiling in a selective way to other persons, he shows an advance in his social behavior, but, to the extent that his response involves recognition and discrimination of persons from other objects, it also represents a significant advance in his mental development. A good illustration of the manner in which various aspects of behavior are interrelated appears in forms of shyness that some infants show at about the age of seven months (sometimes later, sometimes earlier) in response to an unfamiliar person. This response denotes a degree of mental development (discrimination between familiar and unfamiliar persons); it also is a response to another person, and so may be called a social reaction; and it also is an emotional response in that it sometimes involves evidences of fear.

Needless to say, such interrelationships continue throughout life, but with the passage of time many forms of behavior that at first were closely interwoven become relatively more independent and channelized in the form of habits and skills in one sphere that bear little obvious relation to performance in other spheres.

Spontaneous Use as a Feature of Growing Ability. The young child's spontaneous activities parallel and are an integral feature of his growing abilities. As his powers increase he is right on the job to use them. On his own accord, he exercises his eye coordination and his sensory equipment; in his own good time he tries to raise his head and chest, to hitch and propel himself forward, to crawl, creep, and walk. In connection with his language development he shows an outpouring of verbalizations, and in his own way he practices and drills. Within the limits of his restricted concentration span, he will perform acts over and over again, and, once he has gained some mastery, he will proceed to more complex projects that combine several activities. His spontaneous activities parallel the maturation of his ability. The younger the child, the closer is the relation between what he can do and what he does of his own accord.

Throughout later years, interests and abilities continue to be closely associated, but as the child grows older and becomes capable of a larger range of activities his occupations tend to become increasingly a choice between several that might have been undertaken. They come also increasingly to be influenced by prevailing customs, the opportunities that happen to be available, and the demands of his elders. Moreover, a child's spontaneous performance in one area may be disrupted by complications from other areas, as when a child has the ability to sing but refuses to do so by reason of shyness or resistance to frequent urging. Generally speaking, the older the child becomes, the less do his preoccupations of the moment reflect his potential interests. Information concerning a child's abilities often gives a better clew to the interests that he can acquire than do his preoccupations of the moment, or the choices he expresses when approached by means of a check-list or an interview.

Anticipation and Reversion. In the course of a child's progress, he frequently reaches the threshold of a new achievement or mode of behavior, and then reverts for a time to an

earlier level of performance. Such irregularities may appear, for example, when an infant, fed according to his own demands, is making the transition, say, from six to five feedings a day. Again, one fine day he may for the first time walk without support and then for several days fail to do so again, but revert to his earlier performance. Such lapses are likely to appear while the new performance is not completely consolidated. Analogous lapses sometimes occur in connection with an individual's later learning. he may, for example, pedal several yards on a bicycle and then slump for a time. Sometimes such reversions also appear at a time when activities that have developed more or less independently temporarily interfere with one another before they are completely integrated. Sometimes a child will voluntarily fall back upon an earlier and more secure type of performance when he makes new ventures in other performances. While yet somewhat unsteady on his feet, for example, he will at times of stress shift from walking to creeping. At any stage of growth, an individual may likewise revert to an earlier form of behavior in moments of stress, although the conditions underlying such shifts are not exactly the same as those that obtain by reason of lack of complete establishment of a new activity. Thus, under severe emotional stress, older children and adults may display uncoordinated and aimless movements analogous to those of a helpless infant.

"Whole-Heartedness and Gradation." In connection with many features of his progress, a child for a time will seemingly overdo or exaggerate or be completely absorbed in a response or performance that previously has been in process of development and now has become usable. Then, as time passes, the response becomes more subdued or less all-absorbing. As described by Hollingworth, the features in connection with which this phenomenon appears show a characteristic course of development ". . . from the unequivocal to the equivocal; from the whole-hearted to the discriminative; from all-or-none reaction to graded response." ³⁰

Changes that take place in a child's emotional reactions exemplify this principle. In his first identifiable rage reactions, for example, a child tends to throw all that he has, by way of voice and bodily movement, into his show of temper. His responses may seemingly be quite out of proportion to the provocation, and may involve much diffuse movement that is not aimed at anything or anybody and that has no direct value in removing the offending object. As time passes, his physical expressions of anger tend to become less all-absorbing, more directly aimed at the condition that gives offense. With the further passage of time, as pointed out in a later chapter, there is likely to be a further gradation of response, so that on many occasions when he is angry the child no longer shows gross physical outbursts, such as crying or hitting, but resorts to more subtle and indirect forms of attack. In like manner, his anger outbursts tend to become more discriminative with the result that his display of anger is on a mild or violent scale, depending upon the degree of provocation.

Changes analogous to this, over shorter periods of time, can be noted in connection with other features of development. When a child has reached the point at which he first is able to creep, or to walk, or has gained the ability to release an object held in his hand and to throw it, such activities may, for a time, absorb much of his energy. This tendency to give a hard workout to a newly achieved ability may carry so far that other features of development seem momentarily to be at a standstill, as far as their overt expression is concerned.

This tendency during initial phases to be rather expansive or seemingly to overdo not only can be noted in connection with activities that emerge as developmental phenomena through the joint influence of maturation and learning (such as walking) but also frequently occurs in connection with new ventures or discoveries at any time of life. Thus, a child who just has mastered a word for being taken to the toilet may for some days use the word over and over at intervals of only a

few minutes and even good-humoredly accept the inconvenience of being strapped again and again to the seat when his mother takes him at his word. Older children as well as staid adults often exhibit "jags" that resemble (although differ in nature from a developmental point of view) the walking and talking jags of infants. An eight-year-old, for example, for days on end may use every possible device to weave into his speech a newly learned bit of slang or expression that has caught his fancy. A new game or pastime may absorb him almost to the exclusion of all else, and then be relegated to its place among other activities.

On a larger scale, analogous phenomena can be observed in the history of science, politics, and literature. An idea or theory emerges or is formulated and then, for a time, the disciples of the idea are disposed to accept it on a "whole-hearted" or all-or-none basis

The tendency on the part of a child to exercise a new ability, skill, or interest in an extravagant way is not, of course, an invariable phenomenon, but adults who have charge of children will do well to recognize it. Frequently, in the rearing of a child, adults are disturbed and take steps to interfere when a child thus seems to make excessive use of a new outcropping of behavior when actually the child himself is likely to remedy matters in his own good time. There are, of course, situations in which considerations of safety or of the comfort of other persons will require that adults interfere, but quite often adults are disposed to interfere with harmless preoccupations before they have run their course.

SUMMARY

The child at birth exhibits a wide range of behavior which has a history extending back into the prenatal period of growth. Although the child at birth is capable of the processes necessary for maintaining life and is able to exhibit a wide array of movements, his behavior shows many characteristics that will undergo radical changes in time. Much of his

behavior is diffuse and seemingly unorganized. Some of his actions betray the fact that the higher brain centers are not functionally mature at birth

Certain general trends can be noted in the changes that take place after birth. Generalized activity gives way to more specialized activity. New performances are individuated out of previously more inclusive reactions. With the passage of time, also, operations that have become differentiated out of previously more generalized activity are organized and recombined into skills of various kinds.

Development tends to take place in a *cephalo-caudal* direction — from the head tailward. Development also tends to proceed in a *proximo-distal* direction — from the main axis of the body toward the extremities. Examples of these directional trends can be seen in the fact that the child is capable of considerable coordinated movement of the arms while yet he has relatively little control over his legs and that gross movements involving the arms precede coordinated and precise movements of the fingers.

In the process of development two interrelated factors are at work — learning and maturation. Experiences that provide a basis for learning are necessary for normal development, but exercise or training alone cannot produce the changes in capacity and performance that normally occur in the process of growth. In the training of children it is important to take account of the factor of maturation and to adjust requirements and opportunities for learning to the child's readiness. As has been pointed out in the preceding pages, efforts to accelerate a performance by means of coaching or special training are not likely to be effective if the child, by reason of his immaturity, does not have the equipment to profit from such training.

Many of the basic coordinations involved in the use of the limbs appear to depend primarily upon the factor of maturation plus such incidental "practice" as the child undertakes on his own accord. On the other hand, the effects of oppor-

tunities for learning become important in determining the child's acquisition of specialized skills that involve these coordinations. The level of maturity at which a child will be able to profit from opportunities to learn varies in the case of different performances. Further, the effects of training or of special opportunities for learning will be relative to a child's stage or phase of growth.

In connection with many activities a child's ability to profit from training improves as he grows more mature so that in some performances a short period of training, at a later age, will yield as high a degree of proficiency as a longer period of training at an earlier age. Since, in the education of children, there usually is a wide range of choice as to learning opportunities that are provided at a given time, this principle has much educational significance. Available findings suggest that in some features of the academic education of children (notably in connection with mastery of abstract concepts in the social studies and perhaps also in the field of arithmetic) children have been prevailed upon at a relatively early age to grapple with units of subject matter that might be learned more efficiently at a later age. On the other hand, in the field of motor skills, manual crafts, and certain features of musical activity, the educational opportunities customarily provided for children do not appear to have been commensurate with children's potentialities or their capacities for mastery and enjoyment of a wide range of skills.

In the development of behavior from infancy onward certain general characteristics can be noted. Although infants differ in their rate of progress and in their accomplishments at any given time, they show a high degree of similarity in the order in which different developments appear and are consolidated. At all stages of growth various aspects of development — mental, motor, social, and emotional — are closely interrelated.

The child's spontaneous activities parallel and are an integral feature of his growing abilities. This holds true especially during the early years. As a child grows older the

operation of this principle becomes less apparent, since with added age a child becomes capable of a large range of activities and the occupations he himself chooses tend to become increasingly a choice between several that might be undertaken. They also are increasingly influenced by prevailing customs, the opportunities that happen to be available, and the demands of his elders

In the course of a child's progress he frequently reaches a new achievement or mode of behavior and then reverts for a time to an earlier level of performance. In connection with many features of his progress a child for a time will seemingly overdo or exaggerate or be completely absorbed in a performance, and then as time passes his whole-hearted absorption in the project subsides. Frequently in the rearing of a child adults are disturbed by this tendency and take steps to interfere when a child thus seems to make excessive use of a given form of behavior when actually, in many circumstances in which this occurs, the child himself is likely in his own good time to remedy matters.

QUESTIONS AND EXERCISES

- 1 List examples from your own experience or from your observations of others of the phenomenon of "whole-heartedness and gradation."
2. On the basis of your own experience as a pupil or teacher, or your observation of others, can you describe any school subject or assignment that seemed to be insurmountably difficult when first encountered and then seemed to be "easy" when encountered again, after the elapse of some time, without intervening practice? To what extent do you think the change in competence might be attributed to the factor of (a) maturation? (b) incidental practice? (c) intervening learning that did not bear directly upon the project in question but still proved to be helpful?
- 3 What are some of the educational implications of the statements set forth in the section dealing with the topic of spontaneous use (or interest) as a feature of growing ability?
4. On the basis of your own experience or observation, what changes, if any, would you advocate in the "grade placement" of the various subjects or topics that conventionally have been taught

at some time or other during the elementary school period? (For example, does your own information or experience bear out the findings cited in this chapter with respect to processes involved in arithmetic, or concepts in the general area of the social studies or with respect to other matters you were called upon to learn before you were "ready"?)

5. Can you think of any skills which you now wish you possessed and which, in your judgment, might well have been taught in place of some of the things you were required to learn during childhood?
6. Suggest an experiment to provide information as to the age or grade level at which long division might most advantageously be taught. What are some of the complications that would be encountered in such an experiment?
7. Consider the steps one goes through, and the nature of the progress that takes place, in learning a new performance (such as tennis, basketball, knitting, driving a car). In what ways does such an enterprise in its early stages resemble the developmental progress of the young child as described in this chapter? What are some of the differences?
8. In what respects would a blanket rule to the effect that, in the education of young children, use should be made only of activities that involve "gross coordinations" or "large muscle groups" be out of keeping with the "direction" of development as described early in this chapter?

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CHAPTER III

Physical and Motor Development

Most noticeable in the anatomical growth of children is their increase in height and weight, but quite as important in their influence on behavior are the changes with age in bodily proportions and varying rates of growth in different parts and organs of the body.

GROWTH IN HEIGHT AND WEIGHT AND BODILY PROPORTIONS

The most rapid anatomical growth and differentiation occurs during prenatal life. In height, the infant increases from practically zero to an average of about twenty and a half inches at the time of birth. The rate of increase thereafter continues to be relatively rapid during the first two years of life, after which the rate is comparatively slower. By the age of five years, the average boy has increased from about 20.5 inches to about 42 inches, and there is a further increase to about 68.5 inches by the time he reaches his maximum at approximately seventeen or eighteen years.

Varying Patterns of Growth in Stature. Growth curves, such as are reproduced in Figs. 1-3, offer a convenient means of depicting the pattern of growth, the height attained at various age levels, and periods when growth is most or least rapid. A glance at the figures will show that the age at which maximum growth in total height is attained varies with different individuals. There are differences also in the pattern of the growth curve. From Fig. 2, for example, it appears that girls who menstruate at an early age tend for a time to

be relatively taller, in comparison with their final stature, than do girls who menstruate late. As indicated in Fig 3, the patterns of the growth curves in the case of girls whose menarche occurs at about the same age show a good deal of similarity, whether the girls be tall or short.

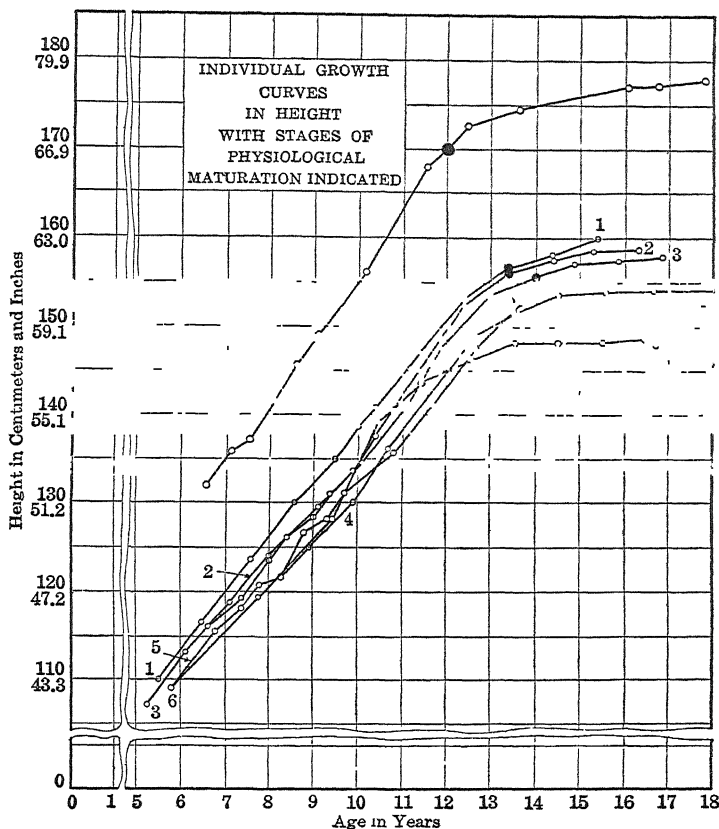


FIG 1 GROWTH CURVES FOR SEVEN GIRLS.

The curves for the tall girl and for Girl 1 are most regular. These two girls had a history of fine health. The other five girls were subject to illnesses and diseases more numerous and serious than the average. Their curves, especially the curve for 6, show minor irregularities. Even so, these curves show general trends quite clearly. The black circle indicates the beginning of pubescence. (From B. T. Baldwin, *The Physical Growth of Children from Birth to Maturity*, University of Iowa Studies in Child Welfare, Vol I, No 1.)

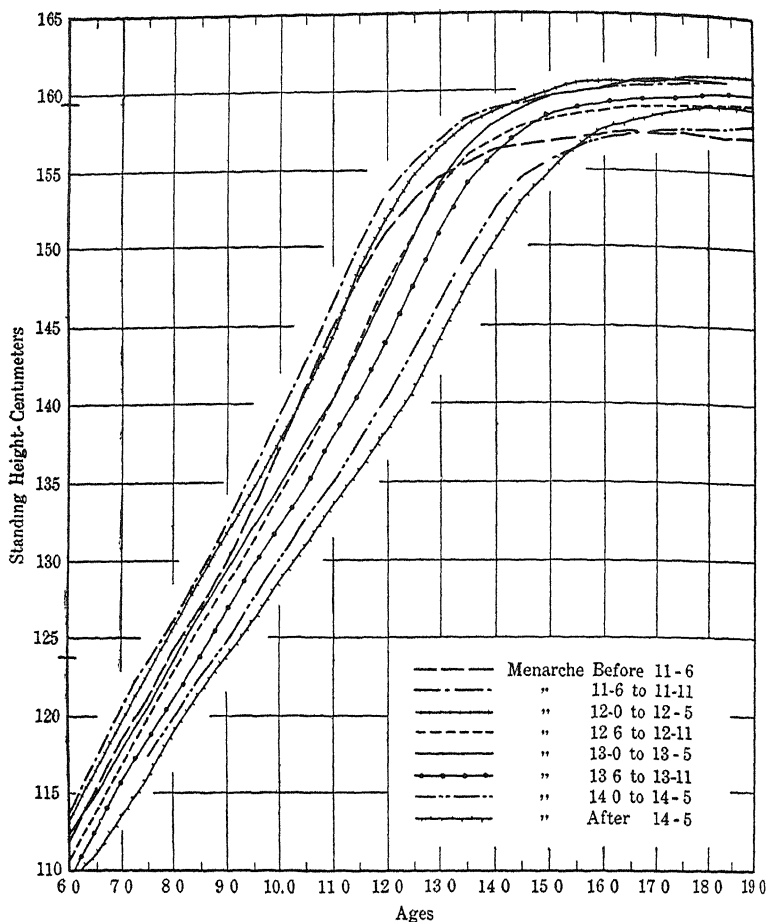


FIG. 2 GROWTH TRENDS IN AVERAGE STANDING HEIGHT FOR EACH OF EIGHT GROUPS OF GIRLS MENSTRUATING AT DIFFERENT AGES

(From F. K. Shuttleworth, *Sexual Maturation and the Physical Growth of Girls, Age Six to Nineteen*, Monographs of the Society for Research in Child Development, 1937, 2, No. 5)

Changes in Size of Different Parts of the Body. The growth pattern varies in different parts of the body that go to make up a person's total stature. The head, for example, which constitutes about a fifth of bodily height at birth, and which has attained approximately ninety per cent of its maxi-

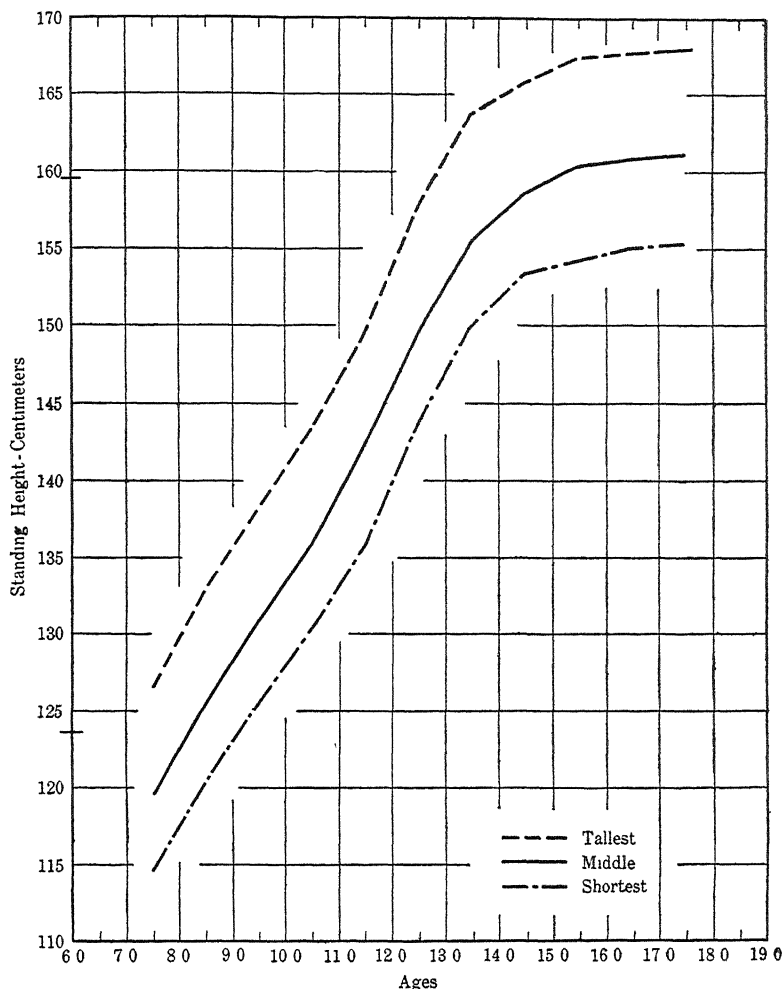


FIG 3. GROWTH TRENDS IN AVERAGE STANDING HEIGHT OF GIRLS WITH THE SAME MENARCHEAL AGE, 13-0 TO 13-5

(From F K Shuttleworth, *Sexual Maturation and the Physical Growth of Girls, Age Six to Nineteen*, Monographs of the Society for Research in Child Development, 1937, 2, No 5)

num circumference by the age of six years, shows a considerably smaller increase than do many other parts of the body, such as the legs. By the time maximum height is reached,

the increase in the length of the legs and of arms is considerably greater than the increase in the length of the trunk; the increase in leg length is greater than the increase in arm length, and the increase in lower leg length is for a time greater than the increase in thigh length.

Within each section of the body there likewise are differences in rate and magnitude of increments. Thus, the face undergoes a good deal of transformation during early growth. Changes in facial proportion are so marked and variable that it is not possible to tell what a young infant is going to "look like" at a later time.

Relation of Height and Weight to Behavior. A child's height and weight as compared with children of his own age (see Fig. 4) may have important influences on his behavior

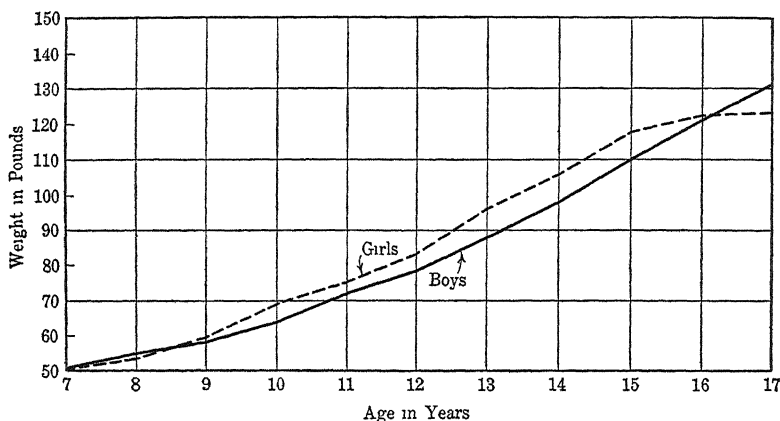


FIG. 4. WEIGHT OF IOWA CITY WHITE BOYS AND GIRLS AGED SEVEN YEARS TO SEVENTEEN YEARS

(From B T Baldwin, *The Physical Growth of Children from Birth to Maturity*, University of Iowa Studies in Child Welfare, Vol. I, No. 1)

and adjustments especially in the case of rather marked deviation, such as obesity or extreme shortness of stature. Usually the factor of bodily dimensions alone, apart from its effect on bodily coordinations, is less important than the child's ability to use his body. A child who is short for his

age may be at some disadvantage in the estimation of his fellows when he first enters a group, but if he is agile and adept in his motor activities such a child may be able to take the lead from a taller and less able individual. The psychological effects of stature will vary at different ages and under different circumstances. A child who is backward mentally, but average or above average in his physical growth, may find that his size brings compensations in some situations, but only renders him more conspicuous as a deviate in others. Likewise, at the time of adolescence, a tall girl may regard her height as a handicap, while the tall boy regards his size as an advantage. Even then, however, the situation of the boy who is relatively short but masculine in build and physiological development may be more favorable than that of a boy who is tall but less "manly" in his bodily proportions and glandular development.

Differences in progress in motor performances may be associated with differences in bodily weight and bodily proportions. In one study¹ it was observed that babies who were thin, muscular, and small boned tended to walk earlier than did babies who were short and heavy, although differences in the rate of locomotor development did not depend entirely on anatomical characteristics. Furthermore, by reason of changes in bodily proportions, the nature of the skill involved in a given motor performance will change with age. Thus, the performance of sitting in a wagon and propelling it with one leg is helped by the increase in leg length from the age of two to four years; on the other hand, as noted in an earlier section, increased length of the legs may complicate certain forms of climbing and the coordinations involved in roller-skating. With the onset of puberty, at about the junior high school age, when differences between boys and girls in size and body build become more prominent, differences in motor ability in the more active types of sports become even more outstanding, as will be noted in a later section.

MOTOR DEVELOPMENT

The Development of Prehension and Locomotion. Many features of motor behavior have been studied in sufficient detail to provide a rather complete picture of the usual sequences in the course of their development. For example, among the noteworthy items in the early reaching and grasping is the development of the ability to oppose the thumb to the fingers in picking up an object. The story of the developments leading up to this accomplishment as traced in genetic studies of infants is a long and involved one, showing progress from gross and uncoordinated movements with the arms, progressive development of independent movements of the arm and hand, the development of eye-hand coordinations, progress from an awkward and poorly aimed approach and from a "scooping" or "corralling" method of grasping to a neat pincerlike use of the thumb opposed to the forefinger ²

The ability to walk alone likewise is preceded by a sequence of developments that can be traced back to the first days of life. The postural developments leading to the ability to walk alone tend to progress from the neck and upper extremities to the trunk and lower extremities ³

In the development of locomotion, as in other aspects of motor development, there are wide individual differences. In one detailed study of twenty-five babies it was found that one child could walk when led by both hands at the age of twenty-one weeks, while a child at the other extreme could not do this until the age of seventy-two weeks. Children who are accelerated or slow in the early stages of locomotor development are likely to maintain about the same rate in later stages. The child who creeps at an early age is likely also to walk at an early age

Later Developments. In the development of motor skills, there is progress not only from more generalized to more specialized forms of activity, but also from specialized to more inclusive activities that integrate operations which earlier.

received separate attention. In connection with many performances, children will concentrate for a time on the establishment of a simple level of skill, then move on to a higher level, and, at various stages of their progress, combine such skills with others that were practiced independently. When mastery is achieved, all of these operations, in turn, may be subordinated to a larger project. An indication of this trend is shown in a study of two- to four-year-old children who were repeatedly observed when brought to a room equipped with a number of wheeled toys (wagon, carriage, dump truck, kiddie kar, and tricycle) as well as other articles, including certain hurdles or obstacles (an archway and an incline).⁴ The children progressed from simple pushing and pulling of the vehicles, in a backing and filling manner, to continuous pushing and pulling, to pushing and pulling over hurdles. Various levels of skill likewise were shown in the manner in which the children combined the use of the vehicles with other materials. As the children acquired skill in pushing and pulling, propelling, manipulation of parts, and the transportation of materials, they gave less attention to these operations as independent activities, but, instead, merged them into a larger enterprise, such as a complicated make-believe game.

Skills Involved in Self-Help. Many characteristics of motor development are illustrated by a child's progress in handling utensils used in eating. The improvements consist not simply in the perfecting of acts that appeared at an earlier time, but also in the differentiation of new features of technique as the child matures. A lengthy sequence of activities precedes the ability to handle a cup, for example, and even after well-defined cup behavior is established refinements continue to take place, such as a shift from using the palm to using the fingers in tilting the cup.⁵ The basic pattern of the coordinations exhibited at any given time seems largely to be determined by the factor of growth, but learning through practice is necessary for the application of such coordinations.

In the development of skill in handling table utensils the child exhibits a phenomenon that appears in many other features of his motor progress. He bides his own good time before he will respond to coaching or urging or opportunities to feed himself. In his own good time he will demand such opportunities and make a very active attempt of his own to lay hold of the utensils and to use them. Where earlier he showed anger when someone else did not feed him fast enough he may now show anger if another tries to feed him at all. In the first phases of his efforts to try his own hand at this job, as in other performances, he is likely to be clumsy. Failure to recognize that such clumsiness is a normal feature of the learning process often leads parents to impose needless restraints and interferences.

In many cases, a child's progress in self-help is attended by a battle to be allowed to do for himself even when he is rather poor at the job. Variations of this struggle appear not only in connection with his routine habits but in connection with his intellectual growth and his social behavior. This struggle in later years sometimes comes to a head when a child, for example, rebels against constant supervision, or goes to great pains to obtain privacy, or, in adolescent years, strives to be "on his own." Sometimes in these struggles the child shows more vigor than wisdom, and sometimes his elders show more caution than prudence. It is noteworthy, however, that many of the "problems" exhibited by youngsters have their inception in the child's wholesome impulse to exercise and to use his growing powers in spite of the mistakes, hazards, and interferences that such use involves.

Changes in Speed, Strength, and Accuracy of Movement. From the illustrations cited above, and many others that might be mentioned, it can be noted that a child's motor progress cannot be described simply by curves that show quantitative gains in such factors as speed, strength, and accuracy of movement. As the child moves to more mature levels of proficiency, there is a change also in the quality of his

performance, in his manner of integrating increases in speed, strength, and precision into new combinations. None the less, the increases in proficiency in tests of relatively simple performances are noteworthy. Tables I and II depict changes with age in a number of representative performances.

Gains in Strength. Gains in strength roughly parallel gains in height. There is an increment from year to year, with a tendency toward more rapid gains from about twelve or thirteen years to about sixteen years in the case of boys. The maximum strength is achieved at about eighteen years.⁶ In the case of girls the greatest gains in strength have been found to occur between the ages of about twelve to fourteen years, and the maximum tends to be reached at an earlier age than is the case with boys.⁷

TABLE I

AVERAGE SCORES OBTAINED BY FIVE-, SIX-, AND SEVEN-YEAR-OLD CHILDREN IN VARIOUS MOTOR PERFORMANCES *

| Activity and Measure Used in Scoring | Age Groups, Years | | | | | |
|---|-------------------|-------|-------|-------|-------|-------|
| | 5 | | 6 | | 7 | |
| | Boys | Girls | Boys | Girls | Boys | Girls |
| 35-yard dash — timed in seconds | 9 30 | 9 70 | 8 52 | 8.84 | 7 92 | 8 02 |
| Hop 50 feet without error — timed in seconds | 10 82 | 10 33 | 9 20 | 8 89 | 8 81 | 7.59 |
| Baseball throw at target — 10-foot distance — error in inches | 8 87 | 16 90 | 5.40 | 13 17 | 4 20 | 8 50 |
| Baseball throw — distance in feet | 23 60 | 14 50 | 32 80 | 17 80 | 41 40 | 24 40 |
| Soccer kick — distance in feet | 11 50 | 8 00 | 18.40 | 10 10 | 25 40 | 15 00 |
| Standing broad jump — distance in inches | 33 70 | 31 60 | 39 30 | 38 00 | 42 20 | 41 00 |
| Running broad jump — distance in inches | 34 40 | 28 60 | 45.20 | 40 00 | 58 80 | 50.80 |
| Jump and reach — vertical distance in inches | 2 52 | 2 22 | 4 02 | 3 48 | 4 98 | 4 28 |

* Adapted from Jenkins, *A Comparative Study of Motor Achievements of Children*.⁸

TABLE II

AVERAGE SCORES IN VARIOUS MOTOR PERFORMANCES TESTED AT INTERVALS OF SIX MONTHS *
MEAN SCORES BY CHRONOLOGICAL AGE

| | <i>Age in Years</i> | | | | | | | |
|--|---------------------|--------------|-------------|--------------|-------------|--------------|-------------|--------------|
| | 12 75 | | 13 25 | | 13 75 | | 14 25 | |
| | <i>Boys</i> | <i>Girls</i> | <i>Boys</i> | <i>Girls</i> | <i>Boys</i> | <i>Girls</i> | <i>Boys</i> | <i>Girls</i> |
| 50-yard dash (seconds) | 7 74 | 7 97 | 7 53 | 7 84 | 7 35 | 7 86 | 7 22 | 7 05 |
| Jump and reach (inches) | 11 1 | 10 5 | 12 2 | 10 0 | 12 4 | 10 6 | 12 9 | 13 6 |
| Target throw at canvas concentric-circle target with outdoor baseball (maximum score 50) | 29 6 | 23 6 | 29 8 | 25.7 | 29 5 | 26 3 | 30 0 | 31 4 |
| Broad jump (feet and inches) | 5' 8 6" | 5' 7 3" | 6' 0 1" | 5' 7 8" | 6' 1 5" | 5' 7.7" | 6' 4 8" | 6' 7 0" |
| Distance throw (in feet, with 12-ounce playground ball) | 105 7 | 66 5 | 116 1 | 70 7 | 119 3 | 74 5 | 123 4 | 129 0 |
| Brace test (Group of tests) ^a | 12 9 | 11 5 | 12 7 | 11 6 | 13 2 | 11 4 | 13 7 | 14 3 |
| | | | | | | | | 75 5 |
| | | | | | | | | 11 7 |

* From Espenschade, *Motor Performance in Adolescence*, Monographs of the Society for Research in Child Development¹⁰

Sex Differences in Motor Performance. As indicated above, it has quite generally been found that the average boy surpasses the average girl in tests of strength, speed, and motor skill during the years preceding adolescence. The differences have been found to be more marked in some tests than in others. Needless to say, the differences between individual boys or girls will be larger at any age level than the differences between the average boy and girl.

It is difficult to appraise the extent to which this superiority of the boys represents a difference in capacity or potential ability, as distinguished from differences brought about by past experiences and opportunity for practice. From an early age, social conventions place more pressure upon boys than upon girls to engage in active, robust, outdoor games, and in activities that involve speed, strength, and athletic skill. In any event, with the onset of puberty, if not earlier, there are definite differences in physique that give boys an advantage in the more robust athletic activities. When they reach sexual maturity, girls are smaller in stature than boys, their arms and legs are proportionately shorter, their trunks proportionately larger, and the female femur is attached to the pelvis at an angle that is mechanically disadvantageous.¹¹

When the same groups of boys and girls are compared by means of repeated tests over a period of time beginning approximately at the adolescent age it has been found that sex differences become more conspicuous as the children become older. In the series of tests represented in Table II it was found that the ability to perform the motor acts in question reached its maximum at about the age of fourteen years in girls but continued to improve through the seventeenth year in the case of boys. It also was noted that there were wide variations within each group and that the performance of boys changed rapidly from time to time. The differences between the sexes are so outstanding, however, beyond the junior high school age, that there are not many conventional athletic activities in which boys and girls can compete on equal terms, so that

"joint participation in physical activities will, except in rare cases, meet only a social need." ¹²

Motor Skills Involved in Handwriting. The motor skills involved in writing have their roots in the child's earliest postural and prehensory coordinations. The beginnings of writing as such occur in scribbles during the first year and onward. Studies of handwriting movements (by F. N. Freeman, *et al*) ¹³ reveal many characteristics that have practical implications. As compared with an adult's, the handwriting movements of a child show more irregularity in pressure and speed, less continuity in the shaping of a given letter or word, more discreteness and longer pauses between separate strokes. As a child grows older, his writing movements also become more rhythmical: each letter or part of a letter, such as a loop, and succession of letters come to be written as a whole, and similar units come to be written in more nearly equal units of time. Freeman has pointed out that the characteristics of early handwriting movements suggest that manuscript writing, which consists of separate strokes, is suitable for young children. Manuscript writing has been found to make writing easier for the beginner. He also suggests that cursive writing, in which words are written as units, is better suited for older children and adults, but points out that the question as to whether children eventually should shift from manuscript to cursive writing for the sake of greater speed (combined with legibility) is in need of further investigation.

Several generations of children have been hounded by the rule that the only proper way to write is to use bold arm movements. This rule was sternly enforced during formal penmanship drills of an earlier day (and still is, in some schools), frequently with little effect. Some justification for this rule might be found in the fact that, in the child's development, certain coordinations involving large muscles precede the capacity for fine coordination of smaller muscles; but to be consistent with this, one should ask the child to write with the charred end of a broomstick rather than a small pencil.

On this subject it has been pointed out by Freeman that arm movement in writing is difficult for young children to acquire and, if taught at all, it should be introduced only after the child has acquired a good deal of motor skill, perhaps somewhere in the intermediate grades.

Handedness. During the first months of life, children do not show a consistent preference for the use of one hand, but eventually a majority of youngsters conform to adult ways and turn out to be right-handed. The younger the child, the more ambidextrous he is likely to be. Even at later ages, individuals will vary in the degree of their right- or left-handedness. Most persons who definitely show a preference for one hand may use the other for certain performances.

Detailed observations of young infants from month to month show that when children do begin to exhibit preference for the use of one hand, the left hand is the favored one in a larger proportion of infants than will be the case later on. In one systematic series of observations it was found that about an equal number of children during the first half year of life showed predominant use of the left or of the right hand. During the second half of the first year, however, there was a marked predominance of right-handers.¹⁴ Moreover, some babies show shifts from time to time in apparent hand-preference. It has also been observed that right- or left-handedness tends to be associated with right- or left-"sidedness," so that there is not only predominant use of one hand, but also of the same side of the body.¹⁵

Theories concerning the origin of hand-preference range from explanations in terms of hereditary predispositions, including inborn inequalities between the two sides of the body that predispose the individual to prefer one side, to explanations in terms of learning, either by chance or by parental design. It appears that both anatomical and environmental factors play a part, and that the relative influence of these factors varies in different individuals. The fact that the proportion of apparent left-handedness during early child-

hood is somewhat larger than at a later time, and that a majority of parents, both wittingly and unwittingly, load the environment in favor of right-handedness, suggests that there might be relatively more left-handers in the adult population if children were left entirely free to develop in their own way.

Since the child is moving into a predominantly right-handed world, steps taken by his elders to encourage right-handedness will be of some advantage to him. However, to take measures against a strong tendency toward left-handedness may have unfavorable effects, especially when such measures involve compulsion and emotional strain.

INTERRELATIONS OF MOTOR ABILITIES

A person who is highly competent in one motor performance (such as handling a ball) is likely to be above rather than below the average in other motor performances (such as jumping), but the relation between competence in various motor activities is so low that one cannot tell from tests of one what a child's competence in another might be. The relation will be higher in the case of activities that require a certain amount of muscular strength, or that involve similar coordinations (such as activities that similarly call for skill in dodging), than in activities that consist primarily of specialized skills. Furthermore, the relation between strength and speed is low, although positive. Needless to say, there are individuals who excel in a wide variety of motor performances, just as there are others who are extremely uneven in their abilities. It is possible that if similar opportunities and encouragements were given to all persons, the relationships between competence in motor performances would be higher than those that are found when tests are administered to children of varying backgrounds. Be that as it may, available evidence indicates that an educational program should not be built on a concept of general motor ability, but, rather, on the concept of motor abilities.¹⁶ This has more than theoretical significance, for it implies, among other things, that a recreational or physical

education program should include a diversity of opportunities if it is not to work to the disadvantage of individual children.

A highly restricted program, with emphasis, for example, mainly upon the conventional game of baseball, may work distinctly to the disadvantage of children who do not happen to be skillful in playing ball, but who may have other skills and potentialities. It is possible, for example, that a child who is rather clumsy at most outdoor games and who is held in low esteem by his fellows may be skillful in other performances, such as handling carpenter's tools, and may be able to gain satisfactions from such skills if given an opportunity to use them. To provide a program that would suit the idiosyncrasies of each individual child would, of course, be impossible, but what often happens is that under a fixed program of activities, directed by adults or adopted by the leading children in a group, a number of youngsters not only get an undeserved reputation for poor motor ability but also fail to obtain opportunities for promoting those motor skills in which they are most capable.

RELATION BETWEEN MENTAL AND MOTOR ABILITIES

In infancy there is a relatively high relationship between a child's motor and mental abilities, partly, it seems, by reason of the fact that it is difficult to make a thorough distinction between strictly "mental" and "motor" performances. If an individual is distinctly subnormal in mental ability he is likely also to be below normal in motor ability, but not necessarily to the same degree. It has been observed, for example, that feebleminded children are likely to acquire the ability to walk at a somewhat later age than children of high intelligence, but they are likely to be even more retarded in their ability to talk. However, bright children frequently are not accelerated, but sometimes lag behind, in their motor development as compared with children of average intelligence.

As mental and motor performances become more clearly differentiated there continues to be a positive relationship

between motor and mental abilities, but this relationship is relatively low. Individuals who are superior in tests of mental ability are more likely to be above average than to be below average in tests of motor ability, but the relationship is so low in the case of individuals within the normal range that performance in one series does not give at all a reliable indication of a person's actual or potential abilities in the other.¹⁷ The relation of motor ability to mental ability is likely to be lower in the case of performances that are relatively simple, or that can be raised to a high level of efficiency through drills and instruction, than in the case of more complex activities that require not only good motor coordination but also ingenuity and resourcefulness in their use. In a sand-lot football game, for example, a bright child with moderate proficiency in the motor skills involved may be a valuable asset to his team by exercising his wits in calling signals and in taking advantage of observed weaknesses in his opponents. On the other hand, it sometimes happens that a child of high intelligence is markedly backward in his motor skills. Such motor deficiency may sometimes be due to physical factors. In other cases the deficiency may be due in part to factors associated with brightness, such as preoccupation with reading and other intellectual pursuits at the expense of outdoor play, intolerance of the simplicity of the rules or the inconsistencies in the play projects of children of lesser intelligence, and the handicap of being younger and physically smaller than the rest of the group if the child is rapidly promoted in the elementary and high school grades.

Although "in personal make-up, correlation rather than compensation is the rule,"¹⁸ so that good abilities tend to go together, the correlation between mental and motor abilities is so low that a group which is homogeneous with respect to one factor is likely to be quite heterogeneous with respect to the other. This condition makes for difficulty in the grouping of children in schools, camps, and playgrounds, but it also has its advantages, for in a rounded educational program it

means that the satisfactions that come from successful achievement can be widely diffused, rather than restricted only to the select children who happen to surpass either in the intellectual or the motor spheres.

MOTOR DEVELOPMENT AND PLAY ACTIVITIES

Changes in motor ability that come with growth obviously play an important role in determining children's play activities, but motor ability is not alone the determining factor. Quite as important are the factors of mental growth and social and emotional maturity.

Although there are large group variations and individual differences at any given age level, certain general trends can be noted in the manner in which motor performances are adapted to play situations at various age levels. In the young infant, play activities parallel the child's progress in locomotion, prehension, and other motor developments; at a later time, the child's play involves practice of the sort that helps him to gain command of coordinations involved in activities such as running, climbing, jumping, hopping, pushing, pulling, manipulation, and throwing. During early preschool years, the child utilizes his skills in connection with make-believe activities, contacts with his elders (as in "helping" with housekeeping), and play with other children. During the middle and later preschool periods, there is a continuation of new ventures if facilities are available, and a further refinement and elaboration of earlier skills. The child occupies himself, for example, in gaining greater speed and control in riding a tricycle, stunting and the undertaking of added hazards, such as riding along a narrow ledge, or down a steep incline, or climbing to greater heights. Increasingly at this age a motor activity or combination of activities will be subordinated to a larger enterprise. By the end of the preschool period, and from then onward, competition is a prominent feature of children's motor activities when two or more are playing together — girls frequently keep count, for example,

when jumping rope, and boys likewise keep a record of their performance in bouncing and catching as each awaits his turn — but it is not until well into the elementary school years that organized competitive teamwork is fully established.

In the early school grades, there is a continuation, in a more elaborate way, of the make-believe interests of preschool years, in such games as keeping house, playing cowboy, and cops and robbers. Such make-believe elements also appear in some standard games, such as puss-in-the-corner. Although the social organization of the games in the early grades is more complex than at the preschool level, the rules and activities still are such as to permit a good deal of flexibility and individual freedom. In running and dodging games, for example, such as pom-pom-pull-away, there is teamwork of a sort, but the team is loosely organized, and in the actual play it is each child for himself.

In the middle and latter elementary grades, organized teamwork, with relatively rigid rules and allocations of the roles of individual players, becomes more prominent. With the coming of adolescence, there is a continuation of some of the organized games of an earlier time, but there also are notable changes. There is an increased interest in intersexual play. Usually when such play between boys and girls appears it consists not so much in the adaptation or revision of current games and sports so that they may be participated in jointly by boys and girls, but rather takes the form of relatively new activities such as dancing. It may even consist of the revival of games of an earlier period that provide bodily contact, such as “round” games, chasing and tussling, or a renewed interest in school or community projects that can serve as a means of bringing the boys and girls together.

Changes with Age in Number of Play Activities. From the time of birth and well into the elementary school years there is a steady expansion in the number of different play activities in which the child engages. But this trend is broken at about the time of puberty, with the result that in late ado-

lescence and at maturity, the average individual is a good deal more sedentary and engages in considerably fewer motor activities, as evidenced in Table III, than does a younger

TABLE III

MEDIAN NUMBER OF DIFFERENT PLAY ACTIVITIES UNDERTAKEN BY PERSONS AT DIFFERENT AGES *

| <i>Age in Years</i> | <i>Median Number of Activities Reported</i> | |
|---------------------|---|--------------|
| | <i>Boys</i> | <i>Girls</i> |
| 8 | 40 11 | 34 44 |
| 9 | 38 45 | 34 75 |
| 10 | 36 57 | 34 89 |
| 11 | 32 29 | 30 65 |
| 12 | 31 40 | 28 32 |
| 13 | 26 48 | 26 30 |
| 14 | 25 13 | 23 85 |
| 15 | 21 59 | 22 04 |
| 16 | 20 40 | 19 77 |
| 17 | 20 79 | 18 33 |
| 18 | 19 39 | 19 90 |
| 19 | 19 04 | 18 61 |
| 20 | 18 40 | 18 59 |
| 21 | 20 29 | 19 57 |
| 22 and up | 17 71 | 16 53 |

TABLE IV

THE TEN GAMES OR PLAY ACTIVITIES REPORTED AS LIKED BEST BY BOYS AND GIRLS AT AGES SIX, TEN, FOURTEEN, AND EIGHTEEN YEARS †

| <i>Boys</i> | <i>Girls</i> |
|----------------------|-----------------------|
| SIX YEARS | |
| Ball or baseball | Playing house |
| Playing horse | Playing school |
| Playing house | Dolls |
| Playing with a wagon | Hide and seek |
| Hide and seek | Jumping rope |
| Playing school | Ball or baseball |
| Marbles | Ring around the roses |
| Football | Playing tag |
| Cowboy and Indian | Mulberry bush |
| Farmer in the dell | Drop the handkerchief |

* From Lehman and Witty, *The Psychology of Play Activities* ¹⁹

† Adapted from Lehman and Witty, *op. cit.* ²⁰

PHYSICAL AND MOTOR DEVELOPMENT 69

Boys

Girls

TEN YEARS

Baseball with a hard ball
Football
Riding a bicycle
Basketball
Boxing
Playing cowboy
Going to the "movies"
Reading books
Roller-skating
Marbles

Reading books
Playing the piano for fun
Dolls, doll carriages, doll clothes, etc
Roller-skating
Going to the "movies"
Riding in an automobile
Playing school
Jacks
Sewing, knitting, crocheting, etc , for fun
Playing house

FOURTEEN YEARS

Basketball
Baseball with a hard ball
Football
Hunting
Reading books
Riding a bicycle
Driving an automobile
Going to the "movies"
Listening to the radio
Watching athletic sports

Reading books
Playing the piano for fun
Going to the "movies"
Social dancing
Going to parties or picnics
Basketball
Reading the newspapers
Sewing, knitting, crocheting for fun
Visiting or entertaining company
Having "dates"

EIGHTEEN YEARS

Football
Basketball
Reading books
Driving an automobile
Tennis
Watching athletic sports
Baseball with a hard ball
Hunting
Just "loafing" or lounging
Having "dates"

Reading books
Having "dates"
Visiting or entertaining company
Reading short stories
Social clubs or being with the gang
Writing letters
Going to entertainments, concerts, etc.
Social dancing
Playing the piano for fun
Driving an automobile

person. Part of this decline consists in the merger of separate activities of an earlier time into larger and more complex enterprises (see Table IV). Part of it is brought about by the fact that older persons do not distribute their time over a wide range of activities but tend rather to spend more time on selected activities. A part of the change consists also, however, in the dropping out of motor enterprises that flourished at an earlier time. By reason of inertia, competing interests in the workaday world, lack of facilities and opportunity, a large percentage of adults rarely utilize in their work or recreation numerous motor skills that they acquired during childhood years.

Implications for Education. This high mortality of childhood games has implications for the motor education of children, for it suggests that the program for children might profitably be planned with more reference to the future. Frequency of use in later years, of course, is not the sole criterion of the utility of a skill, for it may have served a good purpose at an earlier stage of growth. Moreover, some skills acquired in childhood may be quite handy to have at the adult level even if a person seldom uses them (swimming, for example). However, this still leaves a wide field for selection.

Observations of children in free situations indicate that the program of motor activities, and even children's expressed preferences in games, are influenced to a large extent by conventions, and do not adequately reflect the interests that might be cultivated and enjoyed in childhood as well as in later years. An examination of the program in motor activities from the point of view of the future utility of what is learned would not necessarily require the elimination of games that now are emphasized. It would, no doubt, show that many possibilities are now overlooked, such as training in handicrafts, building, mechanics, and in the skills and applied lore involved in hiking, woodcraft, nature study, gardening, and other outdoor pastimes.

The extent to which opportunities to acquire familiarity and some degree of skill during childhood may influence a person's leisure time activities as an adult is indicated in a study conducted in a suburban community.²¹ By means of interviews, information was obtained concerning the "constructional" activities in which men had participated during the preceding year (activities involving the use of the hands and of tools as in cooking, carpentry, photography, building or repairing furniture, sketching, painting, etc.). It was found that only a small percentage of men who did not participate in one or more of such activities during the age range from six to eighteen years had adopted such activities as hobbies or as favorite leisure time occupations in adult life. On the other hand, approximately one-half of the men who participated in constructional activities during childhood years also participated in them as adults. When reasons were advanced for not participating, twenty-nine per cent of the responses were to the effect that the individual lacked knowledge or skill. The investigator plausibly points out that this percentage would undoubtedly be higher if real reasons, free from rationalizations, had been given in all instances.

Effects of Opportunities for Experience and Coaching. Although, as noted in an earlier chapter, there are definite limits to the effects of special coaching on the sequence and tempo of early motor development, there are, of course, countless ways in which a child can be helped to improve upon his techniques, even from an early age. Simply to provide a child with facilities and opportunity to try his hand at various enterprises is likely to be to his advantage. However, even if equipment and time and space are available, a child may quite fail to realize his potentialities. In connection with most performances, the example or direct help of another child or an adult may expedite a child's progress by showing him new techniques or better ways of proceeding. An example of this is offered in a study of young children's use of wheel play materials.²² Children who had the facilities and who also

had older siblings made more progress than those who had no older brothers or sisters.

Similarly, it has been noted that an adult can expedite a child's learning of better techniques in games such as ring-toss,²³ baseball, and numerous other projects. Such instruction, suited to the child's level of ability, not only helps to short-cut the learning process and to prevent the establishment of inefficient ways of performing, but the added mastery thus attained is likely also to add to a child's enjoyment of a project. Although this seems to be no more than a truism, it also seems to merit emphasis, for it can readily be ignored by a teacher who applies too literally the slogan that children should learn by doing in their own way, without assistance from adults. In practically all motor performances, including manual performances of an artistic sort, such as drawing, modeling, or playing a musical instrument, a child can profit from concrete instruction without necessarily suffering a loss in spontaneity or "creativeness." This is especially true by reason of the fact that in children as in adults there often is quite a discrepancy between what a person is trying to perform and what, through lack of technique, he is able to perform.

Quite as important is the help that a child can obtain from his elders in finding a proper challenge to his growing motor abilities. Even on a rather well-equipped playground or shop a child is likely to fail to make the best use of the facilities if simply left to his own devices. Thus, in a school or camp situation, if similar equipment is provided for children over a relatively wide age range, the average child may reach a point at which his activity consists to a large extent in repetition of standard performances when actually he might be led, through adult help, to discover new possibilities in the environment and to acquire a larger repertory of skills.²⁴

Motor Skills and Social Adjustments. During childhood years much of a child's social intercourse with other children takes place by way of active play, and a child's competence

in motor activities may have an important influence on his social adjustments. For this reason, a child may, through physical disability, or lack of opportunity, or overprotection, or unfortunate experiences that lead to fear of venturing into active play, be seriously handicapped in his social relations with his peers. He is barred from many group activities, and in many situations he will be ignored or even become the butt of teasing and ridicule. His plight is especially unfortunate if his motor deficiencies are combined with a strong desire for social contacts and social approval. This does not mean, of course, that every child must be a robust athlete to achieve normal social adjustment, for some children who are lacking in motor ability gain acceptance and satisfying social contacts by other means, especially if they are bright or have other outstanding talents. In the case of the usual child, however, the acquisition of motor skills is of value not only from the point of view of the personal satisfactions that accrue from competence in self-help and independence of adult aid, but also from the point of view of good mental hygiene as it concerns the child's social and emotional relations with others.

SUMMARY

The child's physical and motor development illustrates in many ways the principle that development proceeds in a *cephalo-caudal* and a *proximo-distal* direction.

The general pattern of growth in stature, weight, and in the dimensions of various parts of the body tends to be similar in different individuals, but there are many individual variations with respect to the age at which growth is most accelerated and the age at which the maximum growth is attained. The growth pattern varies also with respect to different parts of the body that go to make up a person's total stature.

The process of development of motor behavior consists both of the differentiation of individual or separate movement patterns out of previously more generalized and diffuse activities and also the combining of such movements into new systems.

Gains in speed, strength, and precision of movement appear throughout the period of childhood, but the rate of gain is not consistently uniform. Gains in strength roughly parallel gains in weight, with a tendency toward rapid gains at approximately the time of puberty.

Throughout the childhood period boys tend to surpass girls in a majority of the motor activities and skills involved in children's outdoor games and athletic contests. The superiority of the boys before the adolescent period seems to be influenced in part by the fact that boys receive more practice. When the pubertal phase is reached boys and girls draw even farther apart. The average boy continues to show gains in strength and speed and in proficiency in various motor coordinations for a longer period than does the average girl. According to studies of children at the adolescent level, the differences between the sexes in motor performances becomes so prominent that beyond the junior high school age there are not many conventional athletic activities in which boys and girls can compete on equal terms. Joint participation at this level may still meet a social need.

During the first year of life a larger proportion of children show predominant use of the left hand than will be the case at later ages. It is likely that the proportion of left-handed persons would be somewhat larger than now is the case if each child were left to follow his own bent. Since the child is moving into a predominantly right-handed world, practical steps that may be taken to encourage right-handedness at an early age may be to his advantage. However, the practical value of being right-handed is not so important as to justify stern or coercive methods, with their possible harmful effects, in the case of children who seem to have a strong disposition to be left-handed or whose habit of using the left hand for certain performances is already strongly established before any remedial measures have been undertaken. It may also be noted that few persons are right- or left-handed in a thoroughgoing way.

Individuals who stand high in mental ability also tend on the average to be somewhat superior in motor abilities, but the correlation between mental and motor abilities, although positive, is so low that superiority in one sphere does not betoken superiority in the other. A child who is average or backward mentally may equal or surpass brighter children in many motor activities. This fact has practical significance for education, for in a rounded educational program the satisfactions that come through recognition of successful achievement should not fall to the lot only of the children who are intellectually most able.

A given individual may be quite uneven in his motor abilities. It is true that if an individual stands high in certain motor performances he is more likely to be competent than incompetent also in other skills, but the relationship is so low that an individual's ability in one performance does not provide a reliable index to ability in other, unrelated performances. This fact is also important from an educational point of view: a program in motor or physical education that is restricted to only a few conventional games or athletic events may fail to give all children opportunities that are commensurate with their abilities, and in the process it may to some extent distort children's social relationships and emotional adjustments by providing opportunities for successful achievement and social prestige to children who happen to be most competent in the limited motor activities that are stressed.

The motor and physical activities in which children engage in connection with their play cover a wide range of occupations at different age levels. However, they tend also to be influenced by prevailing customs and to fall into conventional patterns. At all age levels from a preschool period onward the average child has potentialities for mastering a larger number of useful and enjoyable motor skills than have been provided for in the usual educational program or in his opportunities in everyday life.

From about the age of eight years there is a falling off in the

number of physical activities in which children engage. As children move on toward the adolescent level many of them tend to become more sedentary and to become spectators rather than participants. This tendency continues through the high school and college levels. A part of the decline in motor occupations occurs by virtue of the encroachment of other interests, but a part of the decline also seems to be due to the fact that persons encounter practical difficulties in utilizing, at later age levels, many of the motor skills which they practiced assiduously in their games at earlier levels and to the fact that their earlier education has failed to stress skills and crafts that not only are enjoyable in childhood but also are practicable in later years.

The motor activities and manual skills that adults adopt as hobbies or leisure time occupations are determined to a large degree by the opportunities that were provided at the elementary or high school level for acquiring such skills. The evidence from many angles suggests that in the education of children we tend to fail to capitalize on the potentialities for motor learning that would provide enjoyment and wholesome exercise at the childhood level and that also would be advantageous from the standpoint of health and recreation at the adult level.

QUESTIONS AND EXERCISES

- 1 If opportunities are available, observe and record the movements made by children at various age levels while in the process of carrying out one or more of the following performances:
 - a. Reaching for and picking up a small object (such as a little block, or a thimble, etc.) at the age of about three months, about six months, about nine months.
 - b. Throwing a ball at about the age of eighteen months, three years, five years, ten years
 - c. Going up and down stairs at about one year, eighteen months, three years, five years.
 - d. Writing or scribbling with pencil or crayon at about eighteen months, three years, seven years, ten years

What are some of the main differences and similarities in the performance at various age levels?

2. If possible, observe two or more persons who are approximately similar in age but who differ decidedly in skill (say, a beginner, one who has had some practice, and one who has had much practice or the same individual at various stages of his progress) in the act of carrying out a rather complex motor performance (such as riding a tricycle or bicycle, handling a tennis racket, batting a ball, swimming, knitting). Record, as accurately as possible, the movements involved, and, on the basis of these records, describe differences between the performers and the nature of some of the changes that take place in the acquisition of a motor skill
3. Make a list of (a) motor skills which you possess and use daily or occasionally (including everyday performances, athletic skills, manual arts, crafts, etc.) How many of these were first acquired respectively at the preschool (birth to six), at the elementary school, the junior high, the high school, and the post-high school levels? Are there some performances which, in your opinion, might have been learned more efficiently if your first experience with them had come at a later age? At an earlier age?
4. Make a list of motor skills which are more or less common among adults but which you do not happen to possess. Are there any that you would especially wish you might have acquired? What factors prevented you from acquiring them? In the light of this, or your observations of motor deficiencies in people whom you know, what recommendations can you offer concerning ways of helping children to acquire useful or enjoyable skills in connection with the school program and through other agencies?
5. Although, as is pointed out in this chapter, there is, in general, only a low correlation between mental and motor ability, can you think of certain motor performances in which a very intelligent person would be likely to excel? What are the practical implications of this low relationship between mental and motor ability from the point of view of the "grouping" of children in connection with various projects at school?
6. To what extent, in your opinion, are the sex differences in motor achievement among boys and girls at the preschool and elementary school level due to the relative amount of practice and opportunity afforded to boys and girls?
7. Interview members of the class or people of your acquaintance who happen to be left-handed. Find out in what practical and specific ways a left-handed person is handicapped or has difficulty. Get as much information as you can that would bear on the general question. To what extent is the disadvantage of being

- left-handed so great that special effort should be made to train all children to be right-handed? (Take account also of any hazards or emotional difficulties that might be involved if children with a strong tendency toward left-handedness were forced to change)
- 8 What are some of the educational implications of the point set forth in the discussion of the development of handwriting? Has your own experience with handwriting tended to confirm or negate the statements made in this section?

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CHAPTER IV

Emotional Development

The term "emotion" denotes episodes of anger, fear, joy, amusement, grief, disgust, and other conditions in which an individual is "moved" or excited. Terms such as these serve as convenient labels for experiences that anyone can identify in his own life, but none of these labels denotes a fixed or uniform pattern of response. Actually, the varieties of emotional behavior are almost infinite. Emotion not only occurs in the explosive episodes that can be called by a definite name but to varying degrees pervades all thought and action.

Components of Emotional Response. Emotion involves a combination of feelings, impulses, and physical and physiological reactions. The feelings are highly subjective. They can be studied only through the introspective report of the person who experiences emotion and who variously states that an experience is pleasant or unpleasant or that he feels depressed, angry, afraid, and so on. The nuances and mixtures of feeling are countless and are so varied that no one can fully sort them out or adequately describe them.

The impulses involved in emotion include the disposition to advance and destroy, as in anger, or to retreat, as in fear. Such impulses are not, of course, independent elements of experience for they are associated with incipient or actual bodily movements that constitute the physical and physiological components of the emotional response. These latter range from reactions that can be detected only by delicate laboratory tests to gross reactions of the viscera and of the

skeletal muscles, as when an individual vomits in disgust, leaps with joy, or throws his weight about in a towering rage.

Early Emotional Reactions. During the first days of life, the infant exhibits much behavior that seems to have an emotional quality, as when he cries and thrashes with his limbs. However, emotional responses show much of the same lack of differentiation and patterning that is found in other aspects of his behavior, and he is impervious to many stimuli that eventually will arouse him.

Differentiation of Expressions of Emotion. The early reactions that appear to have an emotional quality include much generalized and uncoordinated movement. At the beginning, overt reactions appear more in the form of general excitement than in the form of clear-cut patterns of facial expression, vocalization, and bodily movement that betoken anger, fear, joy, or other states. To be sure, these expressions of emotion never become stabilized into fixed or uniform patterns, but as a child grows older, such expressions do become differentiated to a large extent, so that it is possible, within broad limits, to distinguish between them.

Emotional expression in infancy. One procedure that has been used to study this development has been to take photographs of children while subjected to various conditions calculated to produce various responses such as hunger, pain, anger, and fear (by such means as delaying a child's feeding, exposing him to pinches, restraint of movement, loud noises, etc.) and then to find whether judges who examine the photographs can identify the expressive movements in terms of the conditions that prevailed when the photographs were taken. In one such study, in which moving pictures were used, it was found that infants during the first days of life did not display characteristic expressions that could be identified.¹ During the first year of life, however, such expressions become more clearly differentiated. In one study (by Goodenough) in which photographs of a ten-months-old child were used, it was found that adult examiners showed considerably more

than chance accuracy in judging the conditions that prevailed when each photograph was taken.² Corresponding photographs of an adult who is trying to depict various emotional states can be judged with a considerably higher degree of accuracy, as shown in a study by G. S. Gates.³ Needless to say, the facial expressions of emotion that can be seen on the stage or in everyday behavior of adults are influenced to a large extent by convention. Even so they vary greatly from person to person, especially when used as a means of social intercourse rather than as an involuntary expression of intense feeling; but whether voluntary or involuntary they show a high degree of refinement and differentiation as compared with the first reactions of an infant.

Progressive differentiation of emotional expression in the early years. Among the more specific expressions that emerge during the first months of life are smiling in response to the approach of a person at about four weeks and laughter at a later time. At four weeks according to observations made by Gesell, distinct cries of hunger, anger, and pain can be noted.⁴ The quality of such cries is likely to vary in different infants, so that a mother might be able with some degree of accuracy to judge what her own infant is crying about but fail to interpret the cries of an unfamiliar child. During the first year, likewise, expressions that seem to denote fear, delight, affection can be observed.⁵

As this differentiation of emotional expression proceeds, the movements involved tend to become more specifically adapted to the situation that produces an emotional response. In his first anger responses, for example, the child shows a good deal of uncoordinated movement that is not well calculated to remove or attack the offending stimulus. As the child grows older, his movements during anger become more coordinated and more directly aimed at something or somebody, as Goodenough has shown.⁶ At all age levels, however, intense emotional excitement is likely to involve a good deal of uncoordinated activity.

Decline with Age in Overt Expression. Along with increased differentiation of emotional expression there is also a trend toward increased gradation of emotional response. There is a shift from whole-hearted and violent reaction to more subdued response. The child who at seven months was "mad all over" and who kicked, stiffened, squirmed, flushed, and yelled loudly when his bottle was removed or when his nostrils were being cleaned is likely at seven years to show his anger in less all-pervasive ways (although he still has the knack of throwing a tantrum, a knack which he never loses entirely). During preschool years there is a drop in the frequency of a child's crying and in more obvious displays of anger and fear. This decline, especially in the case of crying in response to hurts and in connection with anger, sometimes is more noticeable in the child's behavior outside the home than in his everyday behavior at home.

Many factors, of course, contribute to this decline in violent expressive reactions. Through the use of language and other symbols the child is able to communicate his feelings more subtly. The child is also under a good deal of pressure to be a big boy or girl and not to act like a baby. He learns that in many situations his problem cannot be solved effectively by violent demonstrations.

The tendency toward inhibition of emotional expression, or of resorting to subtle or indirect means of expression, has gone so far by the time the child reaches school age that his feelings are hidden or disguised to a large degree. However, the decline in public display of emotion is not accompanied by a corresponding decline in private emotional experiences. This has been noted in studies of children's fears by Jersild and Holmes.⁷ For example, a child may seldom exhibit overt signs of fear, or even talk about his fears, in his everyday conduct and yet, when approached by a friendly interviewer, report that he is troubled by fear in many ways. The decline in overt or direct expression, plus the fact that a child has difficulty in formulating his feelings in words, even when he

may desire to do so, greatly adds to the difficulty of understanding the emotional life of the child and the fears, resentments, and desires that influence his behavior in devious ways.

Changes with Age in Emotional Susceptibility. The conditions that provoke emotion change with the individual's expanding abilities and interests. In early infancy, emotion is aroused primarily by stimuli that impinge directly upon the child, and by conditions that affect his immediate, physical well-being. As the range of his activities grows wider, as his world grows larger and encompasses recollections of the past and plans for the future, his susceptibilities increase apace. The emotional stimulus cannot be defined simply in terms of the external condition that confronts the individual, for the effect of this condition will be relative to the individual's own preoccupations and his capacity to perceive what is at stake. His susceptibilities will depend not upon learning alone but also upon maturation. Thus, he may for the first time show fear of strange persons at about the age of seven months,⁸ coincident with improved ability to discriminate between strange and familiar faces.⁹ Similarly, the young child whose anger is aroused only when he is directly thwarted may later respond with anger to indications that his designs may be thwarted at some future date.

Moreover, as an individual's abilities improve and as his interests change he becomes impervious to many events that earlier produced an emotional response. As a child's interests expand beyond the home, he may show less tendency to be jealous of his siblings. As he gains competence in motor activities, he is less frequently annoyed by failure to reach, lift, or dislodge small objects. As the range of his experiences widens, events that earlier were new and challenging and a source of delight come to be taken as a matter of course. However, this change does not mean that emotion plays a smaller role in the individual's life as he grows older, for as some situations lose their potency, others take their place. Throughout childhood and, indeed, throughout life, new or

changing problems and contingencies continually arise. At the age of three, for example, a child may fear or resent unfamiliar persons for reasons that he cannot fully explain. At six, when he is placed "on his own" at school, he may fear or resent rough associates who hit or threaten, but remain relatively impervious to indirect, threatened, or possible dangers that are beyond his ken, such as a threatened economic depression or the possibility that his country will be involved in war. At about twelve or thirteen a child who earlier was relatively unimpressed by such social events may regard them with resentment or anxiety, and such reactions are even more likely to occur in later years when an individual may no longer be troubled by fear or resentment concerning possible violence in his everyday conflicts with people. At the adolescent age a youngster may be subject to worries or annoyances concerning his social relationships with members of the opposite sex in a manner that would not occur at an earlier time. Similarly late youth, middle age, and old age may present issues and concerns regarding health, family matters, prestige, and economic security that were not encountered at an earlier time.

As an individual's abilities and interests change, the same external event may produce quite different emotional reactions. A child's fear of an unpleasant playmate is likely to give way to annoyance as the child learns to cope with him. The boy of six or seven, who is not much interested in impressing the opposite sex, is annoyed by a girl's remark concerning his manners and appearance, but feels humiliated by a similar remark when he has reached the age of puberty.

As an individual acquires the ability to concentrate for longer periods on a project immediately at hand, and to formulate projects and plans that carry over from day to day and from year to year, his emotions become involved in long-term preoccupations, as distinguished from the more immediate or fleeting emotional episodes of early childhood. Also, as the individual acquires the ability to work for deferred

goals and to respond to the passing event in terms of its larger context, his moods tend to become more stable. He does not shift as rapidly from one emotional state to another as does the young child, who frequently makes a quick change from tears to laughter and from anger to joy. Throughout life, however, an individual will be subject to episodic emotional experiences.

Bodily Accompaniments of Emotion. Everyday speech contains many terms denoting the fact that bodily reactions are an important feature of an emotional response. An individual "swells with pride," "flushes with anger," "grows pale with fear," and his "mouth waters" in anticipation of good food. Under varying circumstances, his heart "skips a beat," his "mouth becomes dry," and he has a "sinking feeling in the pit of the stomach." Terms such as these describe only a few of the bodily phenomena that can be observed through everyday observation and laboratory study.

Bodily accompaniments of intense emotion. These bodily responses do not show an aggregation of symptoms that invariably are characteristic of fear, for example, as distinguished from anger or grief. Bodily reactions vary considerably from person to person and in the same person from time to time. There are, however, certain general distinguishing features in these bodily responses. In pleasant emotional excitement, for example, there is likely to be more muscular relaxation, and more extension than flexion of the muscles, than is true in connection with unpleasant excitement. In connection with intense anger or fear there are numerous related physical and physiological reactions that are likely to appear. Reactions of this sort have been described by Cannon,¹⁰ who has made extensive studies of the role played by the ductless glands, notably the adrenal glands, in connection with the excitement of intense rage or fear. There occur numerous changes mediated through one of the divisions of the autonomic nervous system (the sympathetic division) and influenced by increased secretions from the adrenal glands. Among

these changes are the following: the blood is distributed away from the digestive tract and supplied in greater volume to the skeletal muscles; the stomach stops churning, the flow of gastric and salivary juices ceases or is much reduced; there is a rise in systolic blood pressure, the heart beats faster, the bronchial tubes dilate; glucose stored in the liver is made available to the bodily tissues, and subsequent laboratory analysis may show an increase in the sugar content of the blood and urine; there is an increase in the number of white corpuscles in the blood (a safeguard against infection), and the blood chemistry is affected so that the blood in a wound coagulates more quickly. These and other changes, appearing in varying degrees, represent what Cannon has described as a mobilization of energy and endurance to meet an emergency.

Bodily accompaniments of less violent emotion. In the everyday life of the average child or adult, excitement on so heroic a scale seldom occurs, although it is possible even in connection with the fleeting episodes of daily life to verify some of the changes described above, as when a person suffers from a dry mouth and a racing pulse when suddenly called upon to speak in public or finds that his digestion is sluggish while he is recovering from the shock of a threatened traffic accident. Even less violent emotional states have their physiological accompaniments.

Over a period of time, these may have a debilitating effect, especially if a person is chronically perturbed but is unable to do anything about it. Moreover, if physiological accompaniments of fear or anger already prevail, the effect of new provocations is likely to be more pronounced than if the individual is calm and relaxed. This condition is described by the everyday saying that a person is "on edge." In such a condition a mild rebuff or a minor interference may provoke a sharp display of anger, and a passing warning or reminder of danger may produce consternation. Evidence of increased irascibility and excitability was noted in one study¹¹ in which individuals were tested and observed following the injection of adrenalin

in amounts large enough to induce a number of detectable physiological reactions (such as increases in systolic blood pressure and pulse rate, pallor, tremor, dryness of the mouth). Such injections did not directly produce anger or fear, but while the effects prevailed some of the subjects were angered or otherwise disturbed by minor provocations.

The influence of bodily changes in emotion on daily efficiency. The bodily components of unpleasant emotional excitement may serve both as a help and as a hindrance to everyday efficiency. The former effect can be noted when a person who is angry or afraid shakes off his inertia and bestirs himself to overcome a temporary obstacle or danger. Hindering effects can also be noted. In their immediate effects, the bodily changes that accompany fear or anger seem to be better calculated to increase an individual's physical efficiency, his ability to run fast and to hit hard, than to increase his mental efficiency. In the study cited above, various tests were administered to individuals while they were showing a number of artificially induced reactions comparable to some of the bodily symptoms of intense emotional excitement. The results indicated that some of the subjects seemed to improve on tests of motor strength and speed, but their performance on certain mental tasks was, if anything, slightly impaired. Such findings, under artificial experimental conditions, are not crucial or conclusive, but in everyday observations one can likewise find occasions in which a person is so jittery and "keyed up" that his performance suffers. Actually, many of the situations that produce anger or fear in adult life call for the exercise of brain more than brawn, and for skilled movement rather than gross manifestations of strength or endurance. If emotional stress stimulates the individual to undertake a useful line of action, the effects will, of course, be salutary. But quite the opposite is the case if the energies that are mobilized are simply consumed and cannot be harnessed to constructive uses.

ANGER

"Anger" is a term which denotes a large brood of emotional states, ranging from turbulent rage and impulses to rend and destroy to milder forms of resentment, irritation, and annoyance. Feelings and impulses of anger are found in jealousy in combination with fear and sometimes with grief, and in hatred, which usually involves both anger and fear. Anger is a response to the problem that arises when an individual is thwarted and has no adequate response of a dispassionate sort, but still is not completely overwhelmed.

In early infancy, anger arises primarily through interference with bodily movement or with the gratification of the child's appetites, as when his feeding is interrupted or delayed. As the infant's repertory of activities expands, the opportunities for interference of the sort that arouses anger increase apace. The thwarting may occur through the action of other persons, as when he is forcibly restrained or his requests are denied; through inanimate objects, as when an obstruction lies in his path, or by reason of the child's own lack of strength or skill, as when he unsuccessfully undertakes a task, such as opening the lid of a box, which he will be able to handle quite easily at a later time. As a child grows older, anger may be aroused by any form of interference or attack directed against his own plans or ambitions, his reputation, or against any person or condition with which his interests are identified.

The presence of anger bespeaks weakness of a sort (unless a display of anger is deliberately and effectively used as a bluff). For this reason, other things being equal, the greater the discrepancy between a person's competence and his expectations and aspirations, or between a person's skills and the demands that are placed upon him by others, the more frequent will be the occasions for anger.

Contributing Stimuli. Depending upon an individual's condition at the time, and the events that have gone before, the same stimulus may provoke rage at one time and not at

another. A person is likely to be more susceptible to anger when he is physically below par, is fatigued, suffering from lack of sleep, or is hungry.¹² (An army presumably cannot fight on an empty stomach, but husbands, wives, and children can.) Likewise, anger frequently arises by reason of cumulative irritations rather than through a single provocation. Such an accumulation may occur if the child is exposed to demands and restraints from many different adults. Goodenough found, for example, that anger tended to be exhibited more often by children when there were many adults in the household than when there were few. If a child is subject to conflicting or inconsistent demands, or if he is compelled to perform an act over and over again, without visible improvement or accomplishment, as sometimes happens in connection with repetitious drills in the classroom, cumulative irritations are likely to develop. In the same manner needlessly rigid supervision of a person's activities or the restraint imposed by being crowded into a small space with other persons may give rise to such an accumulation.

Frequently such cumulative irritations feed each other, so to speak, so that the effects of successive annoyances lead to successively greater provocations. Hence the annoyance caused by a stubborn knot in a shoelace leads to more vigorous action, with the result that the knot is tightened; as the person's exasperation mounts, he breaks the lace; let the person at this juncture discover also that his other lace is knotted, and he will be in just the right mood to give a wrathful reply when someone reminds him that he should not be so clumsy. In relationships between persons, such cumulative irritations frequently arise, as when a pupil, already annoyed by failure in something that he is doing, is further annoyed by a reprimand from his teacher, who, in turn, takes offense at his retort, and thus further provokes the pupil's anger. In this manner, in the relations of people in the same home or in the relations of persons in the workaday world, mighty animosities may grow from mild beginnings.

Mutual recriminations of this sort are aggravated by the fact that a display of anger directed against oneself arouses an impulse to respond in kind, and the further fact that anger carries with it an impulse to place the blame upon someone or something else.

Expressions of Anger. The crying and overt physical expressions of anger exhibited by a young child give way, at an early age, to a multitude of covert or indirect methods of attack. In early childhood, these may take the form of numerous acts of disobedience and resistance, and when the child has learned to talk he gains command of new resources for expressing his anger. Numerous illustrations of such expressions of anger are described by Goodenough,¹³ who has made the most important study of anger in young children. One three-year-old child, for example, would vent her anger by saying, in the hearing of her mother, that she wished she had another mother.

As time passes, expressions of anger come to include sneers, taunts, innuendo, backbiting, gossip, barbed witticisms, satire, ridicule, and countless other forms of verbal attack. At later ages, likewise, the angry person's expressions of anger may range through all the various forms of opposition and belligerency, from whispering and noise-making in school, when the teacher especially desires quiet, to truancy, delinquency, and crime. The development of imaginative ability provides additional means for the expression of anger in vicarious ways, and for projecting schemes for revenge or future attack. The child may imagine himself dead or violently ill, meanwhile savoring the grief and remorse of his foes, or he may imagine himself in a hero's role that brings discomfiture to those who have opposed him. An individual may go so far as to espouse causes, ostensibly from charity or a desire for social uplift, but actually from vindictive motives.

Recognition of the fact that anger may be expressed in numerous ways, frequently without definite signs of asperity, is useful in dealing with angry persons. Whenever an indi-

vidual, child or adult, without apparent good reason, behaves in a manner that seems to be inappropriate and which directly causes discomfort or may be construed as an indirect attack on someone, it frequently is helpful simply to stop and inquire of oneself, "Why did he do that?" Such an inquiry will often provide clues to underlying motives and suggest ways of assuaging the other person's anger.

Values of Anger. Needless to say, anger may serve a valuable purpose, just as it frequently involves nothing more than needless discomfort and a futile dissipation of energy. Under the spur of anger directed against himself, surrounding conditions, or other persons, an individual may overcome his inertia or irresolution, be jarred out of an unwarranted degree of complacency concerning his behavior and achievements, and proceed to constructive accomplishment. Again, anger at the behavior and inconsiderateness of others may, in some instances, lead an otherwise overindulgent parent or teacher or associate to reexamine his practices and to adopt wiser ways in his dealings with other persons. Quite frequently, however, an individual's anger simply aggravates matters for himself, brings distress to others, or functions merely as a form of projecting his faults upon others.

Methods of Dealing with Anger. The foregoing account of factors contributing to anger and some of the expressions of anger suggest some of the means of dealing with anger. Avoidance of needless restraints or the assignment of insurmountable tasks, tedious repetition, unnecessary confinement, and inconsistent demands would go far to prevent occasions for anger, especially on occasions when an individual is already irritated by reason of previous provocations. One rule that perhaps is ignored as frequently as any is that one should not introduce commands, taunts, or reprimands when there is little or no likelihood that they will do any good, and when there is every likelihood that they will only aggravate matters. Illustrations of this can be found when an adult forcibly tries to get an angry child to eat or to be quiet when every indi-

cation shows that the effort will not succeed, or scolds a pupil when it is certain that the scolding will have no good effect, or when an adult hurls taunts or threats at another who knows very well that the taunts are empty and that the threats cannot be carried out.

Another version of this rule is that one of the best ways to handle anger in another is to curb one's own wrath. This, of course, is much more easily said than done.

Since anger sometimes springs from incompetence, another important means of combating it, both in oneself or in others for whom one is responsible, is to cultivate the skills and abilities that make it possible to solve problems and remove obstacles that provoke rage.

The anger of a child or an associate frequently will be mitigated if one can yield all the points at issue except those that can reasonably be regarded as crucial. Just as one's own anger with respect to one issue is likely to be mitigated by successes and satisfactions that can be won in other spheres, so also in dealing with the anger of others it is often very helpful to seek means of promoting pleasant feelings on issues outside the field of contention. A pupil's anger at his teacher because she is the one who assigned the spelling lesson on which he failed may vanish under praise for his good answer in arithmetic, just as a husband may dispel annoyance at his tardiness for dinner by enthusiastic praise of his wife's mashed potatoes. If too obvious or oft-repeated, this technique will not be very effective, but even in its baldest form it has never been known to do harm if it is dictated by genuine consideration for the other person.

FEAR

Fear, like anger, embraces a wide variety of conditions, ranging from paralyzing terror to mild forebodings and apprehensions. Fear is aroused by events for which a person has no immediate practicable response other than to shrink or flee. Such events range from sudden or intense stimuli for

which the organism is unprepared to situations in which the individual recognizes a real or imagined danger. In early infancy, any sudden or intense stimulus from any sense modality, such as a flash of light, a loud and sudden noise, sudden jars, displacement or loss of support, may produce fright, although babies differ considerably in their response to such stimuli, and the same child will react variously on different occasions ¹⁴

The stimulus for fear cannot be defined simply in terms of a given objective event, such as a noise of given intensity, for in early childhood as in later years a person's response will depend upon countless other factors, such as the condition of the organism at the time, surrounding circumstances, past associations, and the ability to recognize an event as potentially dangerous. During the first months of life, for example, a baby who is unaccustomed to a masculine voice may start, show the whites of his eyes, and then cry if alone with a loud-voiced man, but show no such flinching if held in his mother's lap when the sound is made. Similarly, the effect of a given stimulus will vary as the child's mental and motor capacities mature. As an infant he is impervious to many stimuli that later give him pause, such as a slight rustling sound in a closet near his bed, or a novel event, such as the approach of a strange animal.

As the child's activities and interests widen, the range of his fears likewise widens. When the child is able to carry on imaginative activities and to anticipate future events he also is able to entertain fears of imaginary and remote dangers, and of misfortunes that might befall at a future time even though there is no immediate cause for alarm.

The fears that beset him will be influenced also by his social development. When competitive behavior develops and he becomes aware of his own performance, as compared with standards set by others or imposed by his elders, he may show fear of failure and humiliation. The onset of puberty and the emergence of strong interest in the opposite sex may

entail fears concerning issues that did not trouble him at an earlier time. Likewise, at the adult level, and on toward old age, as already suggested above, his fears will be influenced by the varying contingencies of maturity and old age.

Fears at Different Age Levels. During early childhood, the child's displays of fear are shown predominantly in response to concrete happenings in his immediate environment. During the preschool years, more and more of his fears come to deal with imaginary or anticipated dangers. At the elementary school age, and from then onward, a large proportion of fears concern possible misfortunes that never materialize. As the child grows older and abler, there is a decline in his fear of numerous events that scared him at an earlier time, such as noises, unfamiliar persons, places and situations, everyday objects, animals, and persons¹⁵ However, individual children may fail to outgrow such fears, by reason of the harrowing shock of the original experience or by reason of recurring experiences that strengthen the original fright or by reason of failure to acquire the skills and understanding appropriate to their years. A large proportion of childhood fears persist into adult life (including fears of animals, the dark, being alone, criminal characters, ghosts and the like), sometimes in much the same form, sometimes in a modified version.

Factors Contributing to Fear. Several factors may have contributed to the development of the fears that a person shows at any given time. The fear that is shown may be in the nature of fright that is precipitated by a definite happening, as when a child dashes for the fence when pursued by a bull. It may represent a residual effect of an earlier, quite definite, frightening episode, as when the same child later is afraid to approach the bull, even when the bull seems to be in a tranquil mood. It may represent a reaction to things or events that were associated with the original fright, as when the child fears to approach the locale of his unhappy encounter with the bull, or is frightened when he hears a noise resembling a bull's bellowing, or feels uneasy when he sees the bull's

owner in a place remote from the pasture. Again, fears may have their inception through a process of association that is quite devious: for example, following the excitement and fright occasioned by a fire that he carelessly started while playing with matches, a child may have disquieting thoughts about fire when he goes to bed at night. Such thoughts may thus be associated with darkness and with being confined alone in a room, with the result that the child begins to show uneasiness about being alone in the dark. Fears may also represent an outcropping of uncertainties and anxieties that are rooted in the individual's past history and related in complex ways to difficulties in his everyday life.

Fear precipitated by a definite frightening episode may be momentary and leave no detectable aftereffects, or it may influence future behavior in complex ways. The child who is startled by a pounding radiator may subsequently be afraid to approach the radiator or show fear of being left alone in the room. An older child who is scared by a piercing blast of the whistle of the steam engine of a threshing rig may subsequently avoid this and other similar machines and be afraid of the engineer when he later meets him alone. By virtue of the fact that fears may thus be elicited by events associated with a frightening stimulus, the ramifications of a single frightening experience may be almost endless. Many fears during childhood arise in part through this process of association, but ordinarily the spread of fear in this manner will be limited and temporary unless the frightening effects are reinforced by further repetition or by other fear-inspiring events in the individual's everyday life. However, even when no definite trace of fear remains the effects of earlier frights may persist in subtle ways. Thus, the child may overcome his uneasiness concerning the engineer mentioned above. But some years later, when asked to rate the degree of "geniality" or "friendliness of expression" exhibited by a number of photographed faces he may unwittingly give a low rating to a face that resembles that of the engineer.

Influence of Background Factors. The fears of everyday life are influenced not only by the shock of momentarily terrifying experiences but also by the cumulative effect of everyday setbacks, failures, reminders of weakness or error, and the numerous factors that help to undermine an individual's security and self-assurance and his certainty concerning the adequacy of his own powers. It would not be possible to list all the factors that contribute to such uncertainty, but a few may be noted. A child's fears are influenced not only by the many reminders of his helplessness that he encounters in his own direct experience but also to an important degree by the behavior of his parents. He will be influenced by the example of fear set by his parents or elders. Such an example may suggest to him that there is danger and that the danger is one with which even the adult, upon whom he depends for help, is unable to deal.

Fears likewise are aggravated by the practice of intimidating the child and of playing upon his fear as a means of discipline. When a child is threatened with abandonment or told that the bogey will get him, he is thereby reminded of a possible danger, and, at the same time, it is implied that he cannot rely upon the help of those who use this means of controlling him. By reason of his credulity, the child likewise is susceptible to suggestions that are not wittingly designed to scare him, as when he hears tales of violence and of weird and uncanny happenings.

To safeguard a child against all such influences would be impossible, of course, and perhaps even unwholesome, but this does not alter the fact that vicarious stimulation of this sort may have a profound effect. As a child grows older, and as he passes into adult years, reminders of his shortcomings and weaknesses continue to occur, frequently through his own experience. Discrepancies between his conduct and the standards impressed upon him by others, or formulated by himself, may give rise to feelings of guilt that color his outlook upon the present, leading him to reflect in a self-accusatory

manner upon his past and to entertain forebodings concerning the future. Similarly, he may have a highly developed capacity for self-criticism and self-appraisal, coupled with high aspirations, with the result that he experiences stage fright, for example, before a friendly and admiring audience, or worries concerning his ability to do his job when actually he is highly competent.

By reason of the complex factors that underlie fear, the particular manner in which a fear is formulated or expressed may be relatively incidental. In describing his fears of imaginary dangers, a child may now mention a lion, at another time a gorilla or a walking corpse that he happens to have seen in the movies, at another time a bearded robber about whom he has heard on the radio. In such shifts, the particular image in terms of which fear is described is less important than the underlying disposition that leads to fears of vague and imaginary dangers. In like manner, an adult of the "worrying kind" may be apprehensive now concerning his ability to hold his job, now concerning his bank account, now concerning the possibility that something he said might have caused offense.

Values of Fear. Needless to say, fears in their various degrees and manifestations provide valuable safeguards against harm. They may restrain the individual from precipitous exploits that would end in disaster. Frequently fear promotes prudence and caution and serves as a spur to endeavor and preparedness against the future. A good scare may induce a person to mend his ways after the exhortations of others and his own half-hearted resolutions have borne no fruit, and fear of consequences also serves as a prop to thrift, sobriety, and other virtues.

Although fears frequently are viewed with disfavor, there are occasions when adults who are in charge of a little child wish that the child were more cautious, if not definitely afraid. After a child has learned to walk and climb, for example, here often seems to be a disparity between his ability to get

into potentially dangerous situations and his recognition of danger. He may be able to climb from a chair to the top of a high table, totter precariously on the edge, and, in the process of getting down, clumsily displace the chair so that he misses his footing and falls to the floor. In like manner, his desire to play with instruments such as scissors and knives may be out of proportion to his competence in handling them safely in a manner to avoid serious accidents. He may come to grief through lack of caution in traffic, or through trying to swallow household ammonia or articles from the medicine cabinet which he has procured through one mischance or another. One result of this lack of ready-made fear or caution in response to objects or events that may produce bodily harm is that a child frequently is subjected to interferences of a kind that he cannot understand. Even in the best regulated families interferences of this sort may be a contributing factor in the development of resistance or negativism.

While the capacity for fear, on the one hand, may help to promote caution and prudence, it also may help to give zest to everyday living. In his early play, and later in his games and sports, a child will frequently court danger, although usually within a general framework of safety. Adults, too, will frequently play with fear by taking chances in business ventures or in espousing views that are likely to arouse opposition. As an individual becomes older, however, he usually becomes more conservative in this regard and is less disposed to take chances unless other strong motives come into play.

Fear also may operate as a detriment and entail needless suffering. This is true when the fears a person entertains deal with dangers that are quite improbable and concern matters with which he is helpless to deal, and therefore represent a form of borrowed trouble. It is especially true, also, if the individual, by reason of his fear, is inhibited in his efforts and shrinks from undertaking the very activities that would best relieve his distress.

Prevention and Overcoming of Fear. Complete prevention or elimination of fear would be impossible. The fears of children are so unpredictable that no amount of parental ingenuity could forestall all occasions for fright. Moreover, the very protections with which an individual or a society surrounds itself as a safeguard against fear may foster dependence and weaknesses that invite future calamity. This may be recognized and still leave room for steps to forestall or to overcome fears that seem to have no useful purpose but serve only to inhibit action and to cause distress.

Usually it is difficult to relieve the conditions in the individual's everyday life that contribute to the disposition to fear. Sometimes, however, relief can be obtained from standards that are too high and bring continued failure, belittlement, or invidious comparison with others, over strenuous competition, expressions of strain, tension or rejection in the individual's relations with others. Forewarning will sometimes help to forestall fear of a new situation, and even more helpful will be the procedure of initiating a person into a new situation by degrees rather than precipitously, as when a familiar person remains on hand for a time, or a child is given some freedom to explore and approach in his own way. One study of children undergoing dental treatment, for example, shows how adults differ in their ability to "ease" a child into a potentially trying situation.¹⁶ This graded approach technique holds not only for young children but at all age levels, and it can be adapted also in numerous ways by an adult for his own purposes, as when he ventures into more and more difficult traffic while learning to drive a car.

In trying to overcome an established fear, verbal reassurances and explanation from others may be of some value, but frequently academic explanations as to the reasons underlying one's fears and their groundlessness have little effect. More valuable are procedures that may be used to bring the individual into active grips with the situation or condition that he fears, that promote his practical understanding or in the

case of fears of what the future may bring, practical measures and resources for countering an anticipated misfortune. In studies of children by Jersild and Holmes it has been found that such active procedures, combined, as the occasion warrants, with the graded approach technique, practice, the example and stimulus of other children or adults, can be applied to a wide variety of situations at home and in school and camp.¹⁷ They may even be efficacious in dealing with fears of imaginary creatures that cannot be handled directly but can sometimes be incorporated into active play situations.

Frequently children themselves will improvise ways of using this procedure in overcoming fear of high places, bodies of water, dogs, dark places, and the like. An enterprising adult can likewise find means of making a frontal attack on many difficulties, such as fear of meeting people, stage fright, fear of mechanical gadgets, traffic, domestic animals, of being alone or in the dark, and so forth. He can acquire skills that will provide some measure of protection against feared emergencies, such as fire or accidents, or illness of a member of the family. Even when practical measures such as these fail to dislodge anxieties and phobias that have their roots in obscure experiences in the individual's past life they still can afford some measure of relief. In any event, any scheme whereby an individual can break away from fruitless introspection and private preoccupation with his difficulties, and can harness his emotion to active doing, is likely to have some value.

PLEASURE

Pleasurable states range from turbulent joy, which may be so intense that the individual's behavior is temporarily disorganized, to the quiet pleasures and satisfactions of everyday life. Pleasure may arise through the gratification of cravings such as those associated with hunger, thirst, sex, demand for rest when one is tired. Pleasure is also frequently associated with free and unimpeded activity, the exercise of mental and motor capacities, and ventures into new experiences or un-

familiar undertakings. As far as can be judged from his overt behavior, it would seem that the young child gains satisfaction from sheer activity. As noted earlier, he spontaneously undertakes much exercise of his limbs and his voice in the early stages of motor development and language formation; he seeks social contacts with other persons and seems to find delight in social interchanges; as his abilities expand, he throws himself into imaginative activities, he explores and manipulates, exercises his curiosity, ventures into enterprises that involve the utilization of his various powers.

As a child grows older, events that gave pleasure at an earlier day may lose their appeal as they come to be taken in stride or no longer represent a challenge, and new channels of experience come to take their place. The child at the age of eighteen months, for example, may no longer show signs of delight in response to pots, pans and bottles, and small wheeled objects that can be pulled by a string. Even the pastime of closing doors or opening drawers and throwing their contents upon the floor may be abandoned with other "pleasures of youth." The same child, however, may squeal with delight if he again is presented with a music box or a wagon that he was unable to handle earlier, or he may show signs of enthusiasm in opening a carefully wrapped package that would once have baffled him.

During childhood, a youngster is continually embarking on the new or untried ventures, which, with the passage of time, are "laid by," and in the meantime the ability and opportunity to undertake new experiences emerge. Indeed, the child's very limitations at any period of his growth, while they may give rise to insecurity, anger, or fear, also, in a sense, serve as reservoirs of future satisfactions, for as these limitations progressively are overcome new sources of pleasant experience or achievement arise. To be sure, this source of satisfaction continues into later years, but with advancing age some persons seem to become so confirmed in their ways that they no longer can find new worlds to conquer or new horizons

to explore, with the result that they lose much of the pleasurable anticipation that prevailed when they were younger. It often seems that the stable satisfactions of everyday life, and the security and power that older persons sometimes are able to acquire, quite compensate for this loss. In other cases, however, advancing years bring more boredom than prevailed in youth, and sometimes even distinct "feelings of futility" may beset mature persons who have "arrived." One factor among many others that frequently may bring a fresh store of satisfactions, and may even revive and intensify some of the challenges and the joys of an earlier day, consists in having and rearing children. Grandchildren may also be a boon in this respect. It may be pointed out, in passing, that these satisfactions are also available in some measure to surrogate parents who may have no children of their own. It is interesting to note that when teachers, for example, list the satisfactions connected with their everyday work many of the items correspond to the satisfactions that parents find in the rearing of children.

In the ordinary flow of activity in everyday life during childhood and adult years, an individual is not especially aware of the satisfactions that are associated with his endeavors. On occasion, such as after a good night's sleep, he may be acutely conscious of feelings of well-being as he looks forward to the day's duties. Moments of intensified awareness come also when he successfully overcomes an obstacle or reaches a climax of successful achievement. Such awareness, of a negative sort, comes also in the form of displeasure through failure or the boredom of inactivity.

Some Practical Considerations. To provide optimum enjoyment through activity, an individual's enterprises should be scaled in such a manner that they serve as a challenge to his abilities but do not continually overtax his powers. A proper balance would, of course, be impossible to achieve. Many of the activities of everyday life, even from an early age, are in the nature of chores and routine, repetitious duties that

performance must be done whether they are particularly challenging or not. Likewise, it would be impossible, and quite inadvisable if possible, to arrange every project at the childhood or adult level in such a manner that the individual never would have the experience of failure. This can be recognized and still leave room for taking practical account of principles mentioned above.

In school situations, one often finds pupils who over long periods have little opportunity to experience the satisfaction of successful achievement because the work is too hard for them and they cannot keep pace with the rest of the class. Again, one finds many pupils who are bored and who are driven to daydreaming or mischief because the work is not challenging enough. By reason of the fact that individual differences are so pronounced, it would not be feasible to arrange a school program that involved just the proper stimulation for each child, but much can be done to lower the requirements placed upon the less able child, to give him a chance to exercise those activities in which he is most competent (as when a child who is backward in arithmetic receives a chance to shine in drawing or music if he has a talent for these), and to give special privileges and assignments to those who are most able.

At the adult level, likewise, the importance of having a stimulating occupation is shown in many ways. One of the most difficult problems in life is the adjustment to the loss of an occupation, as when a mother's children grow old and no longer need her constant care, or a person reaches the age of retirement and is left at loose ends, or an able-bodied person loses his job and suffers the demoralizing effects of being unemployed. Occasionally, an individual who lacks an occupation or is bored with the one he has will welcome an emergency, such as illness in the family or threatened economic loss. For some persons, even the calamity of war serves as a momentary tonic, if such a calamity promises to mobilize unused energies and to give the individual a vital function to perform.

Some individuals, of course, seem to become inured to inactivity and appear to be able to enjoy monotony, but frequently those who appear to have made this adaptation still suffer privately from feelings of guilt or a sense of futility, as indicated above. Vocational guidance and large-scale educational and industrial planning may be helpful in preventing the dissatisfactions of inactivity or unstimulating work. The major resources, however, for making use of "activity pleasures" must be cultivated by the individual himself by way of projects undertaken in connection with his regular duties, or through active endeavors to widen his range of interests and skills through stimulating hobbies and avocations.

Praise and Reproof. The topic of praise and reproof is discussed elsewhere in this book, but it deserves passing mention in the treatment of pleasurable and unpleasurable experiences. Praise, when deserved, is a frequent source of pleasure, as everyone knows. Oftentimes an individual, child or adult, who achieves success in a manner that should bring some degree of self-satisfaction will fail to savor his accomplishment until it is recognized and commended by others. This is all the more true by virtue of the fact that what constitutes commendable or successful endeavor is, in many respects, relative to social standards. Thus it is that a person who actually has done well, or as well as he can, is not only pleased but sometimes surprised when his efforts are commended. In like manner, reproof may have the opposite effect, for it indicates that others do not have a high opinion of his performance, whatever his own evaluation of it may be.

Generally speaking, praise or recognition thus may provide satisfactions that otherwise might not be enjoyed. Such praise may also serve as a spur to greater effort, although, occasionally, it may dispose the individual to rest on his laurels. Teachers quite generally subscribe to the view that praise is an effective incentive. In one study it was noted, for example, that every teacher in a group of about 120 wrote that they "agreed" with a policy of "Using praise more often than

rebuke or reprimand as an incentive in school work.”¹⁸ Yet, in another study involving a similar selection of teachers in the same school system it was noted that this policy was by no means consistently practiced. During a series of visits to a number of classrooms, observers recorded, among other matters, the instances in which individual children were reprimanded, reprovved, or informed in one manner or another that their behavior or answers were unacceptable, as well as instances in which the children received praise, commendation, or favorable recognition in one form or another.¹⁹ It was found that, in a majority of the classes, “negative” items of reproof and the like outnumbered “positive” items of praise and recognition. In the case of one group of teachers the ratio of “negative” to “positive” items ran as high as five to one. This ratio need not necessarily be regarded as representing a bad state of affairs (it was noted, for example, that one teacher who often reprovved also seemed to be very well liked by reason of other qualities that appealed to her pupils), but be that as it may, the preponderance of negative items in a group such as this is still of some interest.

If similar observations were made in the home environment it is likely that a preponderance of negative over positive comments would likewise be found in many cases. What often seems to happen is that good deeds or acceptable behavior come to be taken more or less for granted, while misdeeds or performances that are below the required standards are reprovved. Much the same also seems to occur quite often in the relations between adults. A man does his job well, day after day, without receiving, or even expecting, any special word of commendation. Praise is frequently reserved for eulogies after such a worthy person is dead. Much the same may occur in the everyday affairs in the household. A morning when there is no fresh cream for the breakfast coffee may elicit grumbling reproaches by a person who quite forgets the hundred and one mornings when cream was provided, sometimes at the expense of some inconvenience to others.

To be sure, this state of affairs is perhaps as it should be. Many children at an early age learn to expect reproof for misdeeds or failure without expecting corresponding praise for meeting expectations or even surpassing them. Moreover, at school, as in business and at home, there is much unspoken or tacit commendation and approval. The fact still remains, however, that most adults would do well now and then to remind themselves that children, whether they be "problem" or model specimens, and adults, whether they be humble or mighty, are likely to receive a lift from occasional praise or special recognition.

AFFECTION

The beginnings of affection appear during the first few months of life. In time, the affections of the normal child come to embrace many objects and persons. As he advances into adulthood, he will entertain varying degrees of affection for his home and family, his neighborhood and his country, and various institutions with which his interests are identified. The nature of his attachment will vary at different times and in different circumstances. The potentiality for affection is inborn, but changing interests as a child grows older and the details of learning and past experience play an important role in determining the manner in which this capacity is expressed and the objects with which it becomes associated. The affection of a young child for his parents will be influenced by the care they bestow upon him. Through intimate association in his everyday life he may also acquire a fondness for a certain toy or household article, such as a blanket, and such objects may come to be prized more than newer or costlier possessions. As the child becomes sexually mature, his affection for the opposite sex will be influenced by sexual desire. The coming of children of his own will enlist affection in which new elements of impulse and feeling come into play.

In all of the manifestations of affection, whether they involve attachment to a teddy bear, one's parents, spouse, children,

college, or country, there will be varying admixtures of self-interest, since love for other persons and things has its roots in concern for self and represents a form of self-expression. However, the fact that love for others may represent only an egocentric extension of self-love is not as important as is the fact that normal human beings have the capacity for developing affection that enables them to sacrifice their own immediate self-interest and to go to such lengths of loyalty and devotion as to be tantamount to a genuine form of self-denial. This capacity is tapped in countless prosaic ways in a mother's daily care of her child. It sometimes is tapped on a larger scale when calamity strikes a home or community, or in times of national emergency and disaster. It is a stronger safeguard against social disintegration than the best laid plans of erudite men.

Manifestations of affection from his elders are important for the normal development of a child and throughout life a person has a strong desire for assurance that he is wanted, that he belongs, and can count in some measure upon the loyalty and devotion of someone else. Such manifestations in childhood not only promote satisfaction and security but also provide examples from which the child can learn and which he can emulate in due time. Especially unfortunate is the situation of a child who is denied such evidences of affection but witnesses their bestowal on other members of the household. Affectionate fondling and embraces may, of course, take the form of parental self-indulgence, and if bestowed in excess they may operate as a form of interference with the child's activities. That individual children may construe them as such is indicated by the fact that children of preschool age sometimes use hugging and kissing as a form of aggression. Moreover, the child will be at a disadvantage if the affection bestowed upon him at home curtails his ability to form attachments outside the home.

Children likewise desire acceptance and affection from their teachers, councilors, club leaders, and other adults who

substitute for parents. There is, of course, much overlapping between the characteristics of a good teacher and those of a good parent. In a study in which children described the teachers whom they liked best, a large percentage of the replies dealt with qualities that characterize an agreeable human being in any walk of life, including items such as kindness, sympathy, a genuine interest in children as children, and fairness combined with firmness.²⁰

LAUGHTER AND HUMOR

Smiling and laughter may occur in connection with experiences ranging from joy and gayety to bitter anger or sorrow, although in children, and to a somewhat lesser extent in older persons, such expressions more often betoken pleasant than unpleasant emotional states. Even more complex than these overt expressions are the reactions that fall under the general heading of "humor."²¹

Just when the average child exhibits what might be called "a sense of humor" is difficult to determine, and the answer will depend upon what we define as humor. Even before the age of a year, some children have been observed to show roguish behavior, as when a youngster creeps rapidly toward a forbidden object while a parent looks on, then stops short, looks laughingly at the parent, then makes further false starts as though trying to make the parent laugh, too. Situations such as this, involving an element of "fooling" and doing the unexpected, can be noted more frequently as children grow older.

The situations that provoke laughter, or by means of which a child appeals to the risibilities of others, eventually become varied and numerous, of course, but certain rough parallels can be observed between the situations that children seem to regard as funny and other general aspects of their social and intellectual growth. Thus, as a child progresses in the development of perception of space and size he may laugh at disproportions or incongruities of a spatial nature (such as a tiny

hat on a large head) to which he did not respond at an earlier time. As he progresses in his language development, he will increasingly be able to appreciate humor involving a play upon words. When he has acquired some degree of understanding of social conventions, he can find humor in tabooed topics or situations in which the joke is on persons who are in authority. With the approach and onset of puberty, he may "get the point" and relish jokes relating to sex that did not appeal to him so strongly at an earlier age.

Practical Implications of Laughter and Humor. Unfortunately, there are no neat rules that can be offered concerning how a person can cultivate or utilize a "sense of humor" in his dealings with others. The most common (and most futile) admonition is that one should not take himself too seriously. There are, however, a few rather simple generalizations that can be made. One rather obvious generalization is that most children, even at an early age, welcome an opportunity to laugh. Even a very sober child, whose elders are constantly weighed down by the grave responsibilities of parenthood, may show a surprising capacity for laughter when in the company of a playful person. At the school-age level, pupils are only too pleased to find something to laugh at, although frequently the atmosphere at school, as at church, is so solemn that children hesitate to laugh when something funny occurs, unless the teacher gives a signal, such as smiling or laughing himself. Another point that is quite simple, but often ignored, is that children (in common with adults) would rather laugh *with* others than be laughed *at*. One investigator²² noted that many teachers are more inclined to evoke spiteful or vindictive laughter, that has the effect of humiliating individual pupils, than to use laughter in a friendly way.

SUMMARY

Components of emotional experience include feelings, impulses, and physical and physiological reactions.

The development of emotional behavior parallels and is

interrelated with other aspects of a child's growth. During the first days of life the infant shows much behavior that seems to have an emotional tone. As far as his overt behavior is concerned it is difficult to note distinct emotional patterns. His behavior seems to be more in the nature of "general excitement" than in the nature of distinct reactions to which labels such as fear, joy, affection, or anger can be attached. Moreover, the infant appears to be impervious to many stimuli that eventually will arouse him.

With the passage of time the child's emotional behavior becomes more clearly differentiated so that it becomes possible, with some degree of certainty, to distinguish between movements, facial expressions, and outcries that seem to denote anger or fear or joy. However, at no time of life is this differentiation so complete that there is any one emotional state that can be defined in terms of symptoms and expressions that are unique and distinct from the expressions that occur in other states. The varieties of emotional behavior are almost infinite, and emotion, in varying degrees and manifestations, pervades all thought and action.

As a child's abilities mature and the range of his experiences widens, there are changes in his susceptibility to stimuli that cause emotional response. At the beginning, his emotional reactions occur mainly in response to events in his immediate environment that impinge directly upon him. His fears are displayed primarily in response to concrete happenings such as noises, sudden jars, flashes, or any intense or sudden stimulus. His anger, when it appears, occurs at the start mainly in response to direct thwartings or interferences that are imposed by others or that occur by reason of his own ineptitude. Similarly, his manifestations of pleasure revolve around the direct satisfaction of his physical needs or as an accompaniment to his motor activity.

With the passage of time this state of affairs is altered. As he grows in his ability to discriminate between different events and to understand meanings associated with happenings that

occur, as he enters into a wider range of social contacts, as he acquires the ability to imagine, to lay plans for the future, and to anticipate future eventualities, and as he gains in competence and familiarity in dealing with everyday happenings in his immediate environment, there is a falling off in some emotional reactions that appeared at an earlier time and an increase in his susceptibility to other circumstances. By the time he has reached the elementary school age, and to a prominent degree thereafter, his fears will be concerned to a large extent with imaginary dangers or with dangers that might befall. Paralleling this, in normal children, there is a decline in expression of fear of common noises, of the unfamiliar in the everyday environment, and of places, persons, and situations that once were novel but now have become familiar. Similarly, the child's anger, as he grows older, is shown not only in response to direct interference but to events that he regards as possible interferences with his desires, goals, plans, and purposes. There is likewise a shift in the occasions that produce joy or satisfaction: activities that earlier provided a challenge and a seeming source of delight, such as his first successful venture in stair climbing, or riding a tricycle, lose their stimulating value as the child gains mastery and learns to take them in his stride; in the meantime, other delights may occur as the child's powers expand and the range of his activities widens.

Changes likewise can be noted in the overt manifestation of emotion. With advancing age during late infancy and preschool and elementary school years, there is a shift from "whole-hearted" to more graded or subdued forms of response. In keeping with this there is a noticeable decline in crying. Overt signs of fear such as flight or clinging to adults tend to diminish. Explosive symptoms of anger give way to more subdued expressions. Subtle and indirect forms of expression are substituted for the more direct and obvious expressions of an earlier time. In many instances private thoughts and make-believe activities are substituted for overt action. One result

of this is that the older child's feelings tend to be somewhat inscrutable. He may entertain fears that are not recognized even by those who daily associate with him, and harbor resentments which are difficult for another person to detect and which influence the child's behavior in ways that are devious and hard for his associates to understand.

An important feature of the child's emotional life is the affection that he receives from others and the development of his own affection for other persons. Real or imagined threats to a child's relations with objects of his affection may produce jealousy of a severe order. Children who are rejected, or who feel that they are not wanted and that no one is fond of them, are likely to encounter many problems of adjustment.

In the foregoing pages we have seen indications both of the values and of the disadvantages that may be involved in emotional behavior. As pointed out in these earlier pages, even the emotional states that betoken failure or lack of ability to cope with an issue in a straight-forward manner — such as anger and fear — may have salutary effects. On the other hand, as noted earlier, the physiological reactions involved in intense emotional excitement may have a debilitating effect and consume energy to no good purpose. A display of anger or the harboring of resentments frequently merely aggravates, rather than solves, a person's difficulties. Likewise, a person may be burdened with fears that are quite out of proportion to the dangers that threaten him or the tensions that may be needed to promote caution and prudence, and so serve only to inhibit activity and to cause distress.

In earlier sections numerous practical observations have been made concerning ways of dealing with emotional behavior. It may be emphasized that it would be impossible completely to prevent the occurrence of anger, fear, or other forms of emotional distress. However, in everyday life such emotional reactions frequently are aggravated by interferences, threats, examples, and various forms of intimidation that could be avoided. In like manner, it has been emphasized

that in promoting wholesome satisfactions and pleasures it is important, among other things, to give the child an opportunity to enter into activities that provide an appropriate challenge to his growing abilities. Frequently anxieties and resentments arise through the cumulative effect of circumstances in the child's daily environment or in his past experience. For this reason it is important, in dealing with the child who appears to be emotionally maladjusted, to inquire as far as possible into his background. It is also important to help the child to overcome remediable weaknesses, to help him by degrees to acquire competence and skill in coping directly and actively with problems in his environment that cause anger by reason of his inability to solve them, or that cause fear by reason of his actual or imagined inability to deal with circumstances which he regards as a threat to his safety.

QUESTIONS AND EXERCISES

1. Make a list of the fears you recall from your own childhood and discuss this list in the light of the foregoing account of children's fears. To what extent do your own experiences confirm statements that have been set forth in this chapter? In what ways would you supplement or criticize the discussion in the light of your own experience?
2. On the basis of your own recollections, or on the basis of observation of children, give an account of factors that may be helpful in overcoming fear.
3. What details can you add to the description of "indirect or disguised expressions of anger"?
4. Give an example of the way in which a given circumstance at one stage of growth, or in one setting, might elicit one emotional response (such as fear) and in other circumstances might elicit another emotional response (such as anger).
5. On the basis of your own experience or observation of others, cite examples of (a) situations or events that aroused an emotional response at one stage of growth but had no such effect at a later stage; (b) situations or circumstances that produced no effect at an earlier stage of growth but did cause anger or fear or elation at a later stage.

- 6 A large proportion of the troubles or misfortunes that children and adults "worry" about never materialize, fears with respect to what *might happen* are far in excess of the misfortunes that actually do happen. Do you think there is any way in which this state of affairs could be avoided? To what extent is it likely that this seeming excess of fear actually helps to safeguard the individual against disaster?
7. Give an example from everyday life of the way in which animosity between two persons may be intensified by the tendency to make an angry response to another's anger.
8. What are some of the techniques that adults may use that may have the effect of disturbing a child's self-confidence or "sense of security" and thereby render him more susceptible to apprehensions of various kinds?
9. What is the psychological justification for the statement that "A soft answer turneth away wrath"?
- 10 A given class includes pupil *A* who is very bright and pupil *B* who is rather dull. What are some of the happenings during a school day that might be conducive to anger, or apprehension, or satisfaction in one of these children and which might elicit different emotional reactions in the other pupil?
11. What are some subtle practices that may give a pupil the impression that he is "rejected" or disliked by his teacher?
- 12 What are some concrete steps that a teacher might take to help a child who seems to be suffering from an abnormal degree of shyness?
- 13 How may the example of fearlessness displayed by another help a person in overcoming his own fear?
14. Keep a diary of your experiences of anger — ranging from mild annoyance, or irritation, or resentment to more intense states of anger (if any occur) — for two or three days (or as long as may be necessary to provide some records). Make a study of these episodes. What were the causes of anger (immediate causes as well as background or contributing causes)? How reasonable do the episodes seem to be in retrospect? What information, if any, concerning the nature or value of anger, or concerning yourself, do these records offer? Such a record might also be kept of other emotional states, including fears, joys or pleasures, grief. If such a record is kept, examine it to find what is the relative frequency and intensity of pleasant as compared with unpleasant emotional reactions. It would be especially interesting to compare your records with those of

others and to try to find reasons for differences and similarities in the records of different persons

15. Modern life provides many conveniences, but many of these conveniences also complicate the business of living. What, in your opinion, are some of the occasions for anger or fear that prevail in connection with modern life but did not prevail in an earlier generation (say fifty years ago)?
16. Can you offer any evidence in favor of the statement that grief, melancholy, anger, or fear are sometimes satisfying?
17. Can you think of situations, under modern conditions, where a strong emotion would be of value?
18. What are some of the impulses that you have experienced when angry or frightened?
19. Is there any likelihood that an average person can learn to control his emotions completely?
20. Can you trace in your own experience or that of others the gradual development of habits of emotional expression, such as habits of "feeling blue," of being easily irritated, of persistent cheerfulness?

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CHAPTER V

Development of Social Behavior

In the development of social behavior in early childhood there are many trends analogous to those found in the child's mental, motor, and emotional development. During the first days of life the child shows little behavior that can be labeled "social," but as the weeks and months pass, there is increasing differentiation of responses directed toward others.

Interrelation with Other Aspects of Development. The widening of a child's repertory of social activities parallels and is interwoven with other features of his growth. Many of the early signs of intellectual growth, for example, appear in connection with responses that form part of the sequence of social development, such as the development of the ability during the first month of life to distinguish between persons and other objects, the ability later to distinguish between the mother and other persons, between familiar and unfamiliar persons, between playful tones and gestures, and other sounds and movements.

The interrelation of intellectual and social behavior is seen especially in the development of language, which involves mental operations in the learning and use of symbols and also operates as a means of social communication. Even the mental processes involved in private thinking have a social orientation, for frequently in his thoughts the individual is trying to formulate answers in such a manner that he can communicate them to others. As the individual argues with himself, in weighing and rejecting alternatives, he is, in effect, marshaling his logic in a manner that will be acceptable to

other persons. In like manner, an individual's social and emotional behavior are interwoven in complex ways, so closely, indeed, that it is only by arbitrary definition that phenomena such as jealousy, shyness, stage fright, affection, and sympathy are treated predominantly as "social" or "emotional" forms of behavior

Interrelation of "Socialization" and "Individualization." The development of a person's behavior as a social creature proceeds apace with the development of his individuality, his status as an independent creature, distinct from others. Socialization and individualization are not antithetical but complementary features in the development of personality. As the young child, for example, progresses in his ability to enter into social contacts, to participate with others in common projects, he progresses also in his ability to express his own private concerns, to assert himself in opposition to others, and to safeguard his privacy as a unique individual. Thus we see, for example, that in the period from about eighteen months to four years the child not only is advancing rapidly in his interest in group activity, in his ability to share and to merge his activities with those of others, but he also is showing much behavior of a self-assertive variety, such as resistance, "negativism," hitting, and snatching. The latter as well as the former varieties of behavior are normal features of social development. The relative prominence of these forms of behavior will vary in different individuals, and in the same individual from time to time. Although individual children may veer toward one extreme or the other, it has been noted that at the preschool level the child who makes the greatest number of social contacts of a friendly or neutral sort is also likely to be above average in the frequency of his resistant and combative behavior.¹

Advances in Group Behavior. Although there are not distinct stages of social development, it is possible to note certain general trends. As mentioned above, the young baby who at first plays a relatively passive social role begins during

the first few months to take an active part in initiating social responses, as when he smiles, laughs, imitates sounds and gestures, calls attention to himself in various ways. His earliest social responses are directed primarily toward adults. He takes notice of other children during the first half year of life, but it is not until well into the second year that he is likely to play cooperatively for more than brief intervals with another child. Even at this age, and well along in the preschool period, the child will spend a good deal of time in watching or in semisolitary activity when with other children, and many of the social contacts that do occur will take the form of parallel action rather than a merger of individual activities in a common enterprise. From two years until the school age, there is an increase from year to year in the amount of time spent in joint action with other children when other children are available. When circumstances permit, there is an increase also in the duration of social undertakings, in the size of the group, and in the complexity of the social unit.

Children of beginning school age are highly "socialized" creatures but, as noted earlier, they still are likely, when managing their own affairs, to operate in relatively small groups representing clusters within a larger aggregation rather than in an integrated group representing as many children as the membership of a large class. A child at this age may form close ties with a few children within the larger grouping while many others remain on the periphery of his social world. A child is not unique in this respect, of course, for at no age level is a person likely to fraternize equally with all members of a class or community, but as he grows older he is better able to operate in terms of larger groupings. In time he can even assume leadership, or act as a follower or participant and take an active interest in group enterprises that embrace the enrollment of an entire class, school, community, or state.

We have less systematic knowledge at the elementary than at the preschool level concerning the process through which children, as they grow older, become capable of group action

on an increasing scale. One difficulty in obtaining authentic information is that the behavior of a group of children, at any given age, will be influenced by the adult who is in charge. However, certain broad lines of social development can be formulated. One such development is the increased interest and ability shown by children in organized activities and in teamwork, as distinguished from more loosely organized activity and a more individualistic type of play. The onset of what may be regarded as real teamwork has been set at about the age of ten years, but this must be regarded as approximate. One reason that we can speak of this only in approximate terms is that behavior will vary according to the environment in which the children have lived; another reason is that teamwork is not a distinct pattern of behavior that suddenly emerges. As a matter of fact, there are rudiments of teamwork in the social play of children from the age of about two onward. Broadly speaking, however, a difference can be noted in a child's reaction to certain forms of social play. Furfey² points out, for example, that "there is a time in a boy's life when team games become more interesting than individualistic play," when the life of the group assumes increased importance to him, and when he is eager to join clubs and gangs. Furfey points out that, according to his observations, a large proportion of boys have reached this development by the age of ten; but at the ten-year level there are also many boys who still show behavior characteristic of an earlier age.

As an illustration of the more absorbing interest in teams at about this age, Furfey points out changes that a given boy may show in his participation in competitive games. At ten years, a boy who earlier, in a baseball game, seemed to be primarily interested in making a hit and being a star, without much regard for the score made by his "side," may now "rather play right field on the winning team than star for the losers."³

Other trends may be noted. In the age range from two to

six years and onward, for example, children acquire increasing awareness of standards of performance as set by others. Associated with this there is an increase both in the child's competitive activities and in his capacity for judging his own performance in terms of a socially determined standard.

Boy-Girl Relationships. When children first begin to participate actively with their peers, boys and girls tend to play together on equal terms. During the preschool and early elementary school years, there is much play between the sexes, and unless customs are imposed by adults or older children, a boy or a girl is likely to show no hesitation about joining a group consisting mainly of members of the other sex, if no other children are available. However, even during the preschool years boys are likely to play more with boys, and girls with girls, if several children of both sexes are available.⁴

In the early and intermediate elementary school grades, this segregation becomes more noticeable. With the approach of puberty, however, children seek activities that can bring members of the opposite sex together.⁵

It has been noted in observations of some groups of children that this increased interest in the opposite sex occurs somewhat earlier in girls than in boys. In the study (by Stolz) referred to above,⁶ it was found that girls developed on the average about one and one-half years ahead of boys, and it appeared, as far as the population involved in this study were concerned, “. . . that in the seventh or eighth grade you may find two-thirds of the girls in the pubertal cycle while two-thirds of the boys have not yet started upon it.” Stolz found, in addition, that there may be a difference between two boys of as much as four years with respect to the onset of the pubertal cycle of growth changes, and there may be a variation of as much as three years in the time at which the cycle is completed. Since the age of onset of puberty varies in relation to many factors, and since there is a large variation between different children in the timing of pubertal development, a corresponding variation between boys and girls will not

necessarily be found in other communities. Parallels to this temporary disparity between boys and girls can, however, be noted in some situations from common observation. Thus, in one series of informal observations by a teacher, it was noted that the girls in an eighth grade in a small village centered their interests (by way of writing notes, after-school conversation) on the boys from the same community who attended the freshman class in a high school some distance away, while the boys in their own class received little attention from the girls and were still preoccupied with their boyish activities, including enterprises connected with a cave in a near-by grove. A discrepancy of this kind raises a problem with respect to mixed games and parties at this transitional age.

Some shifts in standards of worth and of popularity may also occur at this period, although there is more likely to be a positive than a negative relationship between popularity before puberty and during or after puberty. The girl who is plump may become more self-conscious with respect to this condition than was earlier the case. The boy who still retains boyish physical characteristics while his peers are growing more "mannish" may find that attitudes of the boys toward him undergo a change. As time passes, the economic status or the social status of the child's home in the community may have an effect that was not so noticeable before. In the study referred to above, it was noted, for example, that for a girl to be a member of a wealthy family was more of an asset in being accepted socially at the end than at the beginning of the high school period.

Learning and Maturation as Related to the Emergence of Social Responses. Since social behavior consists of response to other persons, it is inevitable that such behavior will be influenced largely by the social environment in which the child lives. However, the outcropping of certain forms of social behavior, and the sequence in which various social responses emerge, is not dependent upon the external environ-

ment alone. The effect of similar environmental circumstances varies as the child matures

Changing social response. An example of this can be found in the appearance of shyness or signs of fear in response to others. As pointed out in the chapter on emotional development, a child during early months of life may be impervious to the presence of strange or unfamiliar persons, and then, when he has reached the age at which he seems capable of a greater degree of discrimination, he may for the first time withdraw, in apparent fear, from a person who is not a regular member of the household, but who has been in the child's presence from time to time in the past.⁷ Indeed, he may for a time show uneasiness in the presence of a person of distinctive appearance whom he previously has seen from day to day. An example of this was noted in the case of a child who showed fear of a maid who differed notably in appearance from other members of the household; this uneasiness, which disappeared after a short time, was coincident with other signs that the child was now able to perceive differences that apparently had not impressed him before. Interesting, likewise, in this connection, are observations concerning certain other forms of social response. In one study two infants from the time of birth to the age of seven months were kept in a highly restricted environment.⁸ Although their attendants refrained from smiling to them, these babies, in due time, smiled and laughed and showed what seemed to be signs of affection in response to other persons. It appeared that these forms of behavior emerged with relatively little stimulation from others.

In like manner, the way in which a child responds to special provisions in the social environment will vary as he matures. If, for example, we take two similar two-year-old children and provide one with the company of several other children of his own age or older, while the other is completely deprived of the company of other children, it is likely that the former, during the tenure of the experiment, will acquire many techniques of social intercourse that the latter does not possess.

However, the behavior shown by this "socialized" two-year-old will consist of an elaboration of social behavior that is characteristic of normal two-year-olds rather than characteristic of normal four- or five-year-olds. An illustration of the manner in which the effects of opportunities for social intercourse are relative to the child's maturity is offered in a study of nursery school children about three years old in which comparisons were made between those who had previously attended nursery school for one or two years and others who had never previously attended.⁹ At the beginning of the school year, the veterans entered into a considerably larger average number of social contacts than did the new children. But during the ensuing weeks, the new children rapidly closed the gap, so that at the end of the school year there was no appreciable average difference between the two groups in the number or quality of their social contacts. The outcome might have been different if the "new" children had previously been denied all contact with other children, whether in or out of school, but this does not obviate the findings as far as they go.

The fact that a child's response to the social environment changes as he matures does not, of course, mean that the mere fact of growing older will necessarily bring about a steady or rounded advance in social adjustments to other persons. For one reason or another, a child of six or eight may be quite adept in his social relations with adults and yet be quite ineffectual in his dealings with other children. Again, an individual's social adjustments may be quite specific to a given situation or set of circumstances; he may be "sociable" and self-possessed in one group and quite the opposite in another. Further, when confronted with a new situation he may for a time revert, in part, to earlier forms of social response. With a strange group, he may resort, for example, to "onlooker" behavior, somewhat resembling the behavior of a two-year-old who is in a group but not of it.

Influence of the culture on social behavior. At any age level, like-

wise, a child's social behavior will be markedly influenced by the culture and customs that surround him. This can be seen, for example, in the differences between the make-believe play of children who live in much the same culture but come from homes where customs differ. In a group of day nursery children from relatively poor homes one may find, for example, certain patterns of behavior, such as a common practice of spanking the doll (or the child who plays the part of the baby), or the enactment of household duties (such as doing the weekly wash) that do not appear so prominently, if at all, in the play of children from more privileged homes.

The effect of the customs of his elders on a child's conduct at an early age is shown in a report of a study of two distinct preschool groups in Russia. The children in one group came from homes in which the parents had adopted features of the "new" mode of life brought about by the revolution; the parents of the other group lived in a community that retained more features of the "old" mode of life. The "old" modes of life were reflected in forty-nine per cent of the games of the latter group, and in only about six per cent of the games of the former. On the other hand, the play of the children from homes with "newer" ways of living included features from the revolutionary mode of life, such as the communal household, and games depicting the revolution.¹⁰ It is likely that when differences such as these appear in the framework of children's games, there still would be a high degree of similarity in other respects, such as the frequency of conflicts, evidences of friendship, leadership, sympathy, and competition, but results such as these still emphasize the manner in which children more or less unwittingly may absorb social forms that have been adopted by their elders. These observations also suggest how it is that ways of behaving that happen to have been imposed more or less arbitrarily by a medicine man, chief, ruling group, or dictator might eventually come to be accepted as the "natural" mode of life and pass from one generation to the next.

Parallels between Social and Intellectual Development.

Interrelationships between intellectual development and social behavior, alluded to in earlier paragraphs are not only of interest in themselves but also have implications for the education of children. This holds true notably in connection with what is known as the "social studies" in the elementary and high school grades. As noted earlier, it is not until the child is well along in the elementary school grades that he normally is capable of actively identifying himself with a large group, or of joining effectively in complex forms of teamwork (unless directed by an older person). A similar trend can be noted in children's intellectual interests relating to other persons or to social affairs. A study of children's contributions during free discussions in the classroom (see Table V) shows that from the second to the sixth grade level there was a sharp increase (from eighteen to sixty per cent) in contributions relating to "current happenings" in which the children were not directly involved. There also appears to be a sharp increase with age in the ability to do what might be called intellectual teamwork in the second grade, eighty-seven per cent of the contributions made by the children were in the nature of "new topics," that is, what the child said bore little or no relationship to what was said by preceding speakers. In the sixth grade, on the other hand, only twenty-three per cent of the contributions were of this nature, while a considerably larger proportion conformed to the theme or topic that others had been discussing. The implications of this study for students of education will be considered in more detail in a later chapter.

INDIVIDUAL DIFFERENCES IN SOCIAL RESPONSE

From early infancy onward individuals show marked differences with respect to various features of social behavior. During the first year of life, children differ notably in the extent to which they are "outgoing" or responsive to other persons, in their display of shyness, their apparent sensitivity

to the behavior of others, their readiness to laugh and to initiate games with other persons (such as simple versions of peek-a-boo). During the second year and throughout the preschool range, children likewise show large differences in displays of resistance, aggressiveness, and sympathy, in the extent to which they enter into social contacts with other children, in their resourcefulness in dealing with others, and in the many complex characteristics that make for their acceptance as friends or leaders in a group. Wide differences can, of course, also be noted throughout the elementary, high school, and later years.

Factors Underlying Differences in Social Behavior.

Factors underlying such differences, and the process by which they come to the fore, have not been explored as conclusively by psychologists as one could wish. One reason, among others, is that the factors, whatever they may be, are so complex that they are hard to weigh or identify. In theory, at least, it would not be difficult to present a case to show how all such differences are due to environmental factors. Simply on the basis of everyday observation of young children in their homes and of the marked differences in the manner in which their elders manage them one can readily conceive that children eventually might come to differ in their tendency to be "sociable," jolly, playful, or dour, aggressive or resistant. On the other hand, it can also be observed that children show wide differences in their early social behavior even when differences in the environment are considerably less marked than the differences one may find in comparing one home with another. Thus, even during the first few months of life one may find marked differences between infants in nurseries that house babies who have been institutionalized from the time of birth, who are under the care of the same attendants day after day, whose daily routine is more systematized than is the case in the usual home, and who similarly receive less individual attention than do home babies. In such a situation, one child from the time when he is only a few weeks old, and

increasingly as he grows older, may characteristically give a more hearty response to other persons than does another as he fixes them with his eyes, follows their movements about the room even when they are attending to other infants, laughs and smiles and babbles to attract attention. Such differences suggest that native or inborn factors may be partly responsible, but it is true, of course, that even though the external environment may seem quite similar for all children, there still may be subtle differences in the treatment received by individual children.* Psychologists are rather hesitant about attributing such differences in social behavior to hereditary factors, for several reasons. One reason is that the behavior such as sociability, tendency to be sympathetic, or to be aggressive, is very complex and cannot be identified in the manner, say, that one can identify a child's skin color and attribute his white or black skin to heredity. Another reason is that in the past there has been a tendency to treat heredity and environment as antithetical or distinct rather than as complementary and, in many respects, interrelated factors. With this has gone a tendency, sometimes, toward extreme partisanship, so that there are those who bridle with annoyance at the suggestion that heredity, in one way or another, might play a part in determining differences in social behavior, just as there are those who bridle at the thought that environment might have an effect on a child's I.Q.

Quite apart from the factors that originally might have disposed a child to differ from another in one feature or another of his response to other persons, it is likely that the characteristic behavior that he shows at any given time will have some effect on others and thus, reciprocally, influence his own conduct. During the first months of life a child, through one set of circumstances or another, may, for example, show more than a common amount of interest in other people. His parents may cater to this interest and, with the passing

* For evidence provided by the Dionne quintuplets see comments at the end of the chapter ¹¹

months, arrange for him to meet many persons, children as well as adults, in the home, on visits to neighbors, or on shopping trips. In this wise, the child may obtain more opportunity to meet and fraternize with people than would a child who happened to be rather fretful at the time when he first began to notice strangers. In like manner, a child who through one circumstance or other tends to show an uncommon amount of resistance or stubbornness in his first run-about contacts with other children may provoke counter-resistance in others to a greater than average degree, and thus be exposed to further stimulation that would have a tendency to confirm his own resistance. Analogies to this can also be observed in later childhood and in adult years. At a given time, an individual may gain favorable attention by reason of some quality he displays, and following this, further opportunities for exercising this quality or ability may be placed in his way. Thus, a person who happened to make a happy turn of phrase in a speech may repeatedly be asked to speak again (while other potential orators remain silent) with the result that through long experience he has a chance to practice and improve upon his art.

Actually, of course, human behavior is not governed by formulae quite as simple as this, but it is possible, through everyday observation, to note how a child's behavior at any given time may influence the environmental pressures that are brought to bear upon him.

Educational Implications of Individual Differences in the Pattern of Social Behavior. In the foregoing we have alluded to the fact that individuals differ decidedly with respect to this or that form of social behavior. One person may be conspicuously aggressive, another conspicuously unaggressive. Further, a person may be very aggressive and also conspicuously sympathetic, while another is similarly aggressive but seldom exhibits sympathetic behavior. There are wide variations, both with respect to any given form of behavior and also with respect to the ways in which various

forms of behavior "go together" in the same individual. This fact has definite educational implications.

For one thing, it is impossible to describe what might be regarded as ideal social adjustment or an ideal combination of characteristics. It is true that certain forms of behavior may prevail to such a degree that they represent a handicap or a form of maladjustment. Thus, a person who is shy may be maladjusted. However, even shyness, as such, cannot be regarded as a form of maladjustment. Nor does the behavior of a very sociable, hail-fellow-well-met individual necessarily represent a model type. By virtue of other characteristics, the child who is shy and given to solitary behavior may actually be better adjusted than his gregarious neighbor. He may be quite content with a small amount of social intercourse. He may deliberately try to avoid social occasions in order to engage in enterprises that best can be pursued in private. In spite of his somewhat hermitlike behavior, he may have more absorbing interests, and make more constructive use of his time and abilities, than the person who habitually runs with the herd and always makes a splash when two or three people are gathered together.

Moreover, a form of behavior which seems, for the time being, to represent a handicap may arise by reason of other characteristics that eventually will be an asset. An example of this appears in the case of a child, alluded to elsewhere in this chapter, who was somewhat of a social outcast in the nursery school but who proved to be popular in the elementary grades. This child had intellectual interests and abilities which were not appreciated by the younger children, but which were appreciated, and served as a means of establishing enjoyable social relations, at a later age.

The foregoing does not mean, of course, that there is no room for guidance, or that a complete policy of hands off should be observed in the education of children. It does mean, however, that teachers and guidance specialists should be wary of setting up a preconceived model or standard and to judge

that all children who do not conform to this standard should be changed. On the contrary, each aspect of a child's behavior should be viewed in the light of the larger pattern of his conduct as a whole. His assets and liabilities cannot be appraised simply by examining now this, now that isolated feature of his behavior. Moreover, if it seems advisable to try to change a child's behavior, the only procedure that will work (short of rigid coercion) will be one that operates in terms of what the child already is and the resources which he already has, rather than in terms of a preconceived standard.

Consistency and Change in Social Behavior. In studies of young children it has been found that many youngsters tend, on the whole, to show a high degree of consistency from year to year in their predominant characteristics. In one study,¹² twenty-five babies were closely observed from the time they were born to the age of two. It was noted that each baby showed characteristics and patterns of behavior that distinguished him from others. It was also found that the babies showed a high degree of constancy with respect to their distinctive characteristics from month to month. There were, of course, shifts in behavior as the children grew older. One child, for example, showed a continuing underlying tendency to be timorous or shy, but the outward manifestations of this varied as he grew older.

In another investigation,¹³ an intensive study was made of sixteen children from the time they were two or three years old until the time they reached the second or third grade (aged eight or nine years). This study deserves special notice even though (as the author points out) it was limited in scope and should be supplemented by more intensive studies of a larger number of children in a wider range of circumstances. On the basis of information concerning the social behavior of the youngsters at the preschool level, it was found possible roughly to classify the children into four groups. One group included children whose most conspicuous or predominant form of behavior seemed to be that of *withdrawal*; another

group included children who could be described as predominantly *conforming* (in a constructive and apparently well-adjusted manner); another group included youngsters described as *invasive* (that is, disposed to proceed rather aggressively and in a somewhat roughshod manner in their dealings with other individuals); a fourth group included children who were conspicuously *cautious* (unlike the *withdrawing* children, these youngsters were sensitive to social situations but seemed to be inhibited or to lack facility for plunging freely into social contacts). Quite obviously, no child was a "pure" type: each child whose behavior fell predominantly into one of these categories also showed behavior resembling that of children in each of the other categories.

During the period of six years covered by this study, many efforts were made to guide or to change several of the children in this group. In a few instances, such efforts seemed to produce changes in the desired direction. However, in several instances the children continued to show substantially the same basic style of behavior throughout the entire period, regardless of adult efforts to produce a change. According to the school records, information and ratings supplied by the teachers, and data obtained through independent observation, ten of the sixteen children remained in the same grouping throughout this period of years. Even so, of course, details of the children's behavior had changed: a child, for example, who was predominantly *cautious* would use different techniques for limiting social contacts at the age of eight than were exhibited at the age of two.

The fact that some children did seem to change substantially is, of course, quite as noteworthy. It is also noteworthy, however, that in the case of the children who did seem to "change," the change appeared primarily to be built upon characteristics and resources that the child exhibited at an earlier age, but to a less conspicuous degree. Moreover, guidance, when successful, consisted primarily in "building upon" assets that already were there. In the case of children who seemed to

change without intensive guidance, the changes apparently occurred by virtue of the fact that the child seemed to have found the opportunity or the provocation to exhibit more prominently certain characteristics and abilities (whether favorable or unfavorable) which the child had exhibited in his own unique way at an earlier age. It was also noted, incidentally, that efforts to bring about a change in behavior at school seemed to be least successful in the case of children of parents whose views concerning the proper training of children differed from the views entertained by the teachers.

RELATIVE POTENCY OF "POSITIVE" AND "NEGATIVE" SOCIAL RESPONSES

Is it more likely that a child, of his own accord, will try to promote his own interests at the expense of others, and that he will tend rather to be resistant, aggressive, and to compete than to be friendly, sympathetic, and cooperative? This manner of putting the question oversimplifies matters, but the question is of some academic interest, for arguments as to what we can count on in "human nature" often are raised by optimists and pessimists alike in connection with the planning of educational program and schemes for human betterment. The answer to this question has been anticipated above. None of these presumably contrasting forms of behavior can be regarded as more "natural" or more "built in" than any of the others. The helpless infant demands much and gives little, but even during the first few months of life he meets the world part way with a friendly smile, laughter, and playful gestures. As he grows older, his demands continue, but he gives as well as takes; he resists his parents and teachers, but he also complies in countless ways; in his dealings with other children, he snatches and he shares; he hits, but he also helps; he shows both aggression and friendliness; he competes and he cooperates.

By reason of the inconvenience occasioned by resistance, fighting, and disregard for the rights of others, these forms of

behavior sometimes seem to predominate over more desired forms of conduct when actually they do not. Since children are under pressure from an early age to inhibit unfriendly forms of behavior, and since the motives underlying their behavior often are mixed, the relative strength of friendly and unfriendly impulses cannot be measured simply by counting the frequency of separate acts, yet such tallies are instructive as far as they go. In one study (by Mengert)¹⁴ two-year-old children were observed when paired with one another in an experimental situation. It was found that overtly friendly acts outnumbered overtly unfriendly acts in the ratio of more than four to one. In studies of the behavior of preschool children at home and in nursery school situations it likewise has been found that activities involving friendly or neutral give and take quite outnumbered aggressive acts, such as hitting, holding, snatching, or quarrelsome interchanges by means of words. In the study, by McKinnon,¹⁵ of second grade children in a classroom situation that permitted a good deal of freedom, it was noted that friendly and helpful interchanges outnumbered instances of hostile criticism or other forms of verbal attack in the ratio of about three to one. This ratio will vary, of course, with different children and in different situations, but a close examination of the details of the behavior of individuals who may even have earned the reputation of being "antisocial" is likely to reveal a large amount of actual or incipient behavior of a friendly and cooperative sort. For the purpose of helping such individuals it is useful to try to recognize and to build upon these positive features.

The sections immediately following will deal briefly with some of the forms of social behavior that have been mentioned above.

SYMPATHY

The capacity for sympathy, for "suffering with" others who are in distress and being responsive to another's joys, is very

important for individual adjustment and for the welfare of society. All children no doubt have potentialities for developing fellow-feeling of this sort to some degree, but the manner in which such feelings will be aroused, and the extent to which they will be expressed in appropriate action depends upon many factors in the child's environment and in his own emotional adjustments. In order genuinely to sympathize with a person who is in distress, a person must have undergone similar experiences of his own, at least to some degree; he must have sufficient mental maturity to be able to perceive that the other person is affected, and eventually he must learn, through his own trial and error or through example and instruction provided by others, how best to give effective expression to his sympathies.

Active expressions of sympathy are relatively infrequent in the behavior of infants. It is inevitable, and necessary for his survival, that the young child should respond much more readily to his own hurts and wants than to those of others. Infants will sometimes cry when they hear others cry, but it is questionable whether this is an expression of sympathy. In a study of the sympathetic behavior of young children, Murphy¹⁶ found that two- and three-year-old children did not generally recognize such evidences of possible distress as black and blue bruises, or being crippled. They might respond to conspicuous bandages, for example, but show no response to a swollen arm. As children grow older they become able to recognize such signs as well as some of the obvious symptoms of another's feelings and to appreciate situations that may give rise to sorrow or joy in another even when no emotion is expressed.

Individual Differences in the Tendency to Sympathize. Individuals differ decidedly in responsiveness of this sort. An individual who in other respects shows good intelligence may be quite blind to many distress situations and appear to be quite callous. Moreover, at the adult level as in childhood, an individual is likely to be more sympathetic toward a person

with whose fortunes he is closely identified than toward persons more remote from him. Thus, a parent is usually quick to sympathize with his own child, although it is also true that the same parent may unwittingly be quite unsympathetic by reason of failure to appreciate a child's distress (as when he mildly ridicules childhood fears that he does not understand) or by reason of a clash of interests (as when an adolescent grieves over a broken date with a person whom the parent dislikes). An individual is also less likely to be sympathetic if he is responsible, or may be blamed, for another's distress, or if an expression of sympathy would clash with his own self-interest. If an individual himself has suffered much or is in distress at the time he will better be able to appreciate the plight of the other person. However, he may be so absorbed in his own misfortunes, or glory so much in his ailments, that he is impervious to the other's difficulties. Sometimes he may even welcome company in his misery.

Factors in the Cultivation of Sympathy. An important problem in education on which there is little systematic information is how best to cultivate intelligent sympathy. Needless to say, there are no simple rules that can be applied, for an individual's disposition to sympathize will be influenced by countless factors, including the unique pattern of his own emotional and social adjustments. As in moral training, the example set by his elders is likely to have more effect than their precepts. Most difficult to acquire is the practical realization that the other fellow may have sensitivities similar to one's own. Frequently it would be a matter of self-interest to have this realization (in coping with an angry person, for example, a moment's effort to try to appreciate his feelings and the reasons for them may accomplish more than arduous counterattacks), but it is blocked by competing impulses. There are occasions, however, when attitudes toward another can be influenced by reminders, such as the suggestion that a child who is being ignored or persecuted by his fellows is afraid and feels badly, or that a youngster who displays

aggressive mannerisms actually would like to make friends but does not know how. Such suggestions are less likely to take effect if an individual's attitude toward another is complicated by fear, jealousy, competition, or other forms of self-interest.

The emphasis in a good deal of children's literature and in their moral and religious instruction is calculated to promote concern for others. To be effective, such instruction must not be too obvious or forced, yet it must come by way of situations that the child can to some extent translate in terms of his own experience.

FRIENDSHIP

From the time when a child is able to undertake active social dealings with others he is likely to show preferences. At the age of two and onward, strong friendships between children may be established and persist over a period of months or even years.

Factors Influencing Choice of Friends. Changing abilities and interests as a child grows older, changes in his private and social adjustments, and differences in the growth pattern of individual children may bring about notable shifts in a child's choice of companions. A child who is a newcomer at school or camp may make friends with one of the more timid members of the group and then develop other ties as he comes to feel more at home; a friendship dominated by one member may founder when the dominated person comes into his own; school projects may bring out latent intellectual or motor abilities that lead a child to seek new associates; friends of the same or opposite sex at adolescence may draw apart if one remains relatively static in his development while the other continues to grow in mental power and emotional maturity.

Friends are likely to show a higher resemblance than non-friends in such characteristics as height, weight, intelligence, honesty, progress in school, motor ability, and the like. These resemblances are not so pronounced, however, that the origin

of friendships can be accounted for on the basis of any one of these items. Needless to say, the factor of propinquity plays an important role in determining the initial establishment of friendships both at the childhood and adult levels, an individual must, perforce, choose his friends among those who are spatially or occupationally near to him in everyday life, but the factor of propinquity alone does not account for the selections that are made from among those who are near at hand ¹⁷ More difficult to fathom are the subtle factors of temperament and personality that draw people to one another in various relationships of friendship. One individual may characteristically seek companionships in which he is the dominant or the submissive member, while another occupies a variety of roles in his relations with his friends; one may establish a semblance of friendship for ulterior purposes, while another is characteristically more genuine

Popularity. The characteristics that make for popularity overlap but do not fully coincide with those involved in friendship, since the latter connotes a relationship embodying mutual concern, while the former may represent little more than a distant relationship between the admired person and his admirers. An individual who is popular with one group of associates (such as his classmates) is also likely to be popular with others who know him (such as his teachers). There are, however, notable exceptions to this, as in the case of a person who wins admiration from his peers for his opposition to those who are in authority, or of a person who curries favor with his teachers but is disapproved by his associates. Again, traits that win favor at one age may not be effective at a later time. "Cute" or "babyish" characteristics that attract older persons for a time may later repel them; the boy who is admired for the independence he asserts by being careless of dress at the elementary level may find that he is shunned in gatherings of adolescent boys and girls.

Affinities between Members of a Group. Any social group is likely to present a highly complex structure when examined

from the point of view of the popularity of its members and the affinities between different individuals. Information concerning these relationships often is quite revealing and may have practical value for those who are responsible for the group. One procedure that can be used in many situations to obtain information is simply to record the behavior of individual members within an aggregation of people, to note interchanges between the various members, instances of ignoring, and friendly and hostile items. Another procedure (involving the use of what are called "sociometric techniques")¹⁸ consists in having the members of a group express their preferences; for example, the members of a class list the names of pupils whom they would like to have as seatmates or as neighbors at their desks; in an institution or in camp, the individuals list the persons whom they would like to have seated with them at table or as cottage mates. In more general terms, individuals may be asked to list two or more persons whom they would best like to have as teammates, as picnic companions, or as everyday friends. A collection of such reports from all the members of a group may reveal interesting things. The choices may reveal that the group as a whole is only a formal aggregation that includes several cliques or coteries that have little in common, or the lines of choice may ramify throughout the entire group. It may be found that there are individual children on whom a large number of choices are centered while other children are definitely on the periphery and are seldom selected, if at all; and that individual members make choices that are reciprocated, while others reach out for individuals who do not want them.

Such indications, in turn, can be made the point of departure for studying the characteristics of individual members with a view to guidance, and sometimes they may be used as the basis for practical rearrangements in the group situation. The method of direct observation or the sociometric procedures described above sometimes can be reapplied at intervals to appraise the progress of individual members, or to check

upon the manner in which a program designed to promote good social relationships is accomplishing its purpose.

RESISTANT AND AGGRESSIVE BEHAVIOR

Early Signs of Resistance. Resistance as a form of opposition to adult attentions appears during the first months of life in the form of stiffening of the limbs, averting the head when the face is to be cleansed, and so forth. As the child grows older, his resistance frequently takes the form of noncompliance with understood requests, and various acts of disobedience and stubbornness¹⁹ It may take an extreme form of negativism so that the individual goes out of his way to do just the opposite of what is wanted, even to his own discomfort, as when a child goes on a hunger strike.

Functions and Provocations. Resistance serves the child as a means of exploring in social relationships and of asserting and testing his own powers. Apart from this, provocations to resistant behavior are inevitable in connection with the young child's daily routine of washing, feeding, and dressing, in the delays that arise in meeting his demands, and in the steps that are taken to safeguard him from harm, as when he is held back to prevent a fall. Parents differ, to be sure, in their ability to circumvent and to handle such situations, but occasions when the child is thwarted for reasons that he cannot fully understand, and which therefore may strike him as a form of opposition, will arise no matter how nimble his parents may be.

Resistance is frequently precipitated by demands that an individual is unable to meet, but often it springs less from lack of ability to do than from lack of inclination to do. In one study (by Rust)²⁰ it was found that many of the items that were resisted by three-year-old children during mental tests (resistance in the form of refusal to try, silence, and so forth) were items that the children were unable to handle, as shown by their failure on later trials after their cooperation had been won; but they succeeded on fifty-eight per cent of

the items that were resisted on first presentation. In the details of everyday life it is possible that the percentage of instances of resistance when the child is actually able to perform would be larger than this. A measure of this sort would be difficult to obtain, however, since resistance frequently arises in response to demands that separately present no great difficulty but cumulatively tax a child's patience and endurance.

Changes Associated with Age. The peak of the more overt forms of resistance usually is reached by about the age of four, but resistance in one form or another persists throughout life. Some children show an interlude of intensified resistance at about the age of puberty when they are striking out for independence in new ways.

Normally, as a person grows older he learns more and more to conform to certain demands, to avoid disliked situations that are not mandatory, and, when issues arise, either to keep silent or to state his objections in straightforward or indirect way. However, at the adult level one can sometimes observe behavior such as furtive quibbling, contentiousness, efforts to obstruct or to respond negatively on inconsequential issues in a manner that resembles the resistance of a small child.

Aggressive Behavior. There is a good deal of overlapping between resistant and aggressive forms of the behavior. The latter involve opposition to others coupled with a disposition to attack. Aggressive behavior can be observed in children's response while angry during infancy and in later years; it can also be noted in their fighting and bickering with one another, in the countless more or less subtle forms of attack exhibited by older children and adults. In the play of pre-school children altercations in the form of snatching another's material, hitting, interference with another's person or possessions, verbal rejoinders of various kinds, occur quite frequently (once every five to eight minutes, on the average, in the behavior of children in three nursery schools that were included in one study²¹) but most of such combats last only a few seconds.

Varying Functions and Motives Involved in Aggressive Behavior. Acts that superficially seem to be similar as an expression of aggression may spring from quite a variety of different motives and serve different functions.²² They may be precipitated by accidental bumps, they may represent a form of experimentation to discover what the other child will do, they may be subsidiary to a desire for another's possessions, they may represent what seems to be a deliberate design to hurt the other person. Sometimes a child, like an older person, will expose himself to a minor criticism or affront in order that he may counterattack.* If resentment already prevails it usually is not difficult to find an excuse for hostile action. Again, combative activities may represent a temporarily wholesome form of behavior as in the case of a child who previously has been curtailed by the domination of one of his playmates but now forcibly asserts his independence while reaching out for friendly contacts with other children; or they may represent a form of behavior that only increases a child's difficulties, as in the case of a child whose social techniques are poor and who fights and thus creates further antagonism when his advances are rebuffed.

Decline with Age in Overt Expressions of Aggression. As individuals grow older physical encounters and verbal altercations give way to more polite forms of everyday aggression. These more subtle forms of aggression, by way of innuendo, verbal criticism, indirect attacks on an individual's reputation, etc., may be considerably more damaging than the more straightforward combats of an earlier day. Usually this shift to more subtle techniques is more pronounced in an individual's dealings with casual associates than with members of his own family. Brothers and sisters frequently stage fine

* Children quite early recognize that unprovoked aggression is frowned upon and devise dodges to circumvent this rule or to excuse their conduct. The claim, "He hit me first," or "He started it" is frequently used. A version of this need for a verbal excuse can be seen in the "favorite joke" reported by a twelve-year-old child, as follows: Mother: So you have been fighting again. How did it start? Son: By John hitting me back.

fight and quarrel after they have reached the stage of non-violence in their dealing with people outside the home, just as all well-adjusted husbands and wives feel free to snap at one another on occasion. Parents (and visitors) frequently overestimate the significance of such altercations and judge that they represent more deep-seated hostility than actually prevails. Apart from the fact that a greater degree of informality usually obtains in the home than outside, there is also the fact that individuals who spend the most time together have the most frequent opportunity to interfere with each other and so they are likely to bicker more or less even when their affection for each other quite outweighs their hostility.

The fact that "mutual friends are also the greatest mutual quarrelers," as was found in one study (by Green)²³ of young children, does not necessarily mean that chronically incompatible sentiments of love and hate exist side by side, although such confusion may prevail in a neurotic individual. Frustrations of various sorts, and aggressive impulses so engendered, are a feature of normal living, just as are impulses of sympathy and affection.

COMPETITION

Competition for Affection within the Home. The circumstances that provoke competitive effort change with an individual's expanding interests as he moves from childhood into mature years. The child's first recognition of a rival is likely to come in the home, where he may be jealous of the attention bestowed by parents upon other children or upon each other. Jealousy is a response to a real or imagined threat to the security of one's position in the affection of others, and a reaction against anyone who threatens to preempt or to withhold satisfactions that are desired for oneself. Various responses involved in the response may be feelings or overt manifestations of anger, fear, and grief. Jealousy does not denote any clearly defined pattern of social and emotional response but serves rather as a label for a variety of reactions that are

related in various ways to other aspects of a person's makeup. All children are likely to experience jealousy to some degree. Numerous conditions may aggravate the response, such as extreme favoritism, invidious comparison, drastic loss of attention at the coming of another child, manifest inferiority in coping with a younger and brighter child, as well as other factors that make for insecurity, such as dissensions between parents.

Competition for Achievement and Prestige. Expressions of rivalry between unrelated children, in matters of size, strength, prestige, achievement, begin to appear as soon as children enter into active social contacts with one another. Most children will try to compete with the performance of others in one way or another by the time they reach school age.²⁴ During the elementary school years competition continues to flourish, as it does throughout life. In the school grades, a child is likely to exert himself more when competing with others for individual honors than when working for a group award. He is likely, however, to exert himself more when working with a group of his own choosing than when assigned arbitrarily to work with certain children. Moreover, the strength of competitive as distinguished from cooperative pressures will vary in different situations and with different children.

Precipitating Conditions. Competitiveness, the desire to work for the ulterior glories of successful competition, and feelings of chagrin in response to failure in such competition, may be aggravated by pressures exerted by parents who seek unduly to realize their own ambitions through their children. Prizes, grading systems, school marks, also serve to remind an individual of his competitive status. However, the role played by the school in promoting competition is small compared with the influence of other factors. In their play and out-of-school enterprises children match their strength and skill, they come to recognize varying degrees of popularity and prestige, and receive frequent reminders of how they

compare with others. Even in a school that has abandoned the practice of labeling the grades by number, putting marks on classwork or on report cards, and the use of stars, prizes, and honor rolls on the blackboard, the children are likely to realize about where they stand, and instead of competing for marks many of the children are likely to compete for other forms of recognition.

Values of Competition. Competition and cooperation are not antithetical, one good, the other bad. Needless to say, competitive pressures frequently are disadvantageous to the individual and to society, but when properly directed they have many values. On the one hand, competition adds zest to many duties that otherwise would be boring (a child will even try to compete with himself, matching one shooter against another at marbles, playing one set of horseshoes against another, and so forth). It also gives the individual a standard to emulate and thereby, through social facilitation, spurs him to greater heights of enjoyable skill. On the other hand, it is not possible to make a thoroughgoing distinction between competition and cooperation, for in many situations one cooperates through joining in competition (as in most outdoor games) and in others one competes in cooperative ventures (as when the members of an organization vie with each other to turn out more and better work). An enterprising person is one who can compete or cooperate or do both at the same time as the occasion demands.

Wherever there are vigorous people, free from malnutrition, indigenous disease, or the lethargy that comes with too much security or stultifying taboos and conventions, there is going to be competition, fortunately for the society in which they live. From an educational point of view, the proper attitude toward competition is not to deplore it on general principles, or to try to stamp it out by grudging rewards to those who are most deserving, or by placing a handicap on those best able to achieve. The practical attitude, rather, should be to turn competitive impulses into the most constructive channels,

to avoid emphasis on ulterior or artificial rewards, to provide, as far as it is possible, that each individual has opportunities that are commensurate with his abilities, and to prevent inequalities in the rewards for useful service.

LEADERSHIP

Forms of Leadership. The beginnings of leadership of a sort can be found in the behavior of young children when they first begin to fraternize with one another. At the preschool level a child may, for example, assume authority by means of dominating techniques, such as pushing the other child about, directing where he shall stand and what he shall do, allotting to him certain toys and withholding others. Leadership gained through domination of this sort is usually short-lived unless the dictator is very clever or powerful. In another situation, a child may take the lead without obvious effort to impose his will but solely through his ability to initiate activities that attract the other child, by offering interesting suggestions that others adopt, by proposing make-believe themes, ways in which various materials may be used and various roles which may be taken. At this early stage, as at later ages, the leader is not always the one who is out in front, giving directions or serving as a mouthpiece for his followers; instead, he may be one who offers quiet comments that others seize upon and adopt as their own, and he may even appoint a titular leader (such as the conductor of the bus in the make-believe play of young children) while he selects a seemingly subordinate role.

Factors Influencing Shifting Roles. At early levels as at later levels the assumption of leadership does not simply depend upon the qualities of the leader; it depends also upon the characteristics of the led and the circumstances that prevail at a given time. A child who assumes direction over certain children may have little voice in the affairs of another group. Again, a child who already is initiated into the operations of a school or camp may take the lead for a time over newcomers

and then lose his influence as the others learn to know their way around. In a situation that calls for capabilities that previously have not been tapped, a child may step from relative obscurity into a prominent position. An example of this is offered in McKinnon's study²⁵ in which children were observed over a period of years from the preschool into the elementary school grades. One girl who had little influence in the nursery school and kindergarten rose to prominence in the elementary grades, and in the third grade she was elected as the class representative in the school at large. This girl was not much interested in the games played by her associates at the preschool level (she would, for example, point out inconsistencies in the make-believe games of her playmates). Later, however, the organized lessons in the elementary grades were much to her liking; they served as a basis for more satisfying social contacts as she joined with others in the work of the class.

Similar changes of role can be seen at all age levels, although oftentimes the persistence of early habits of nonassertiveness, or of a reputation acquired at an earlier time, may prevent an individual from exercising his aptitudes when new occasions arise. An individual who moves to another locality sometimes rises to leadership in a manner that would not be possible in his old group by reason of the fact that they habitually had come to regard him as a minor figure or held an unjust prejudice against him. Such shifts in role sometimes occur when children transfer from an elementary school in the heart of a small community to a large high school, or from high school to college, or from college to occupations in the world at large. Frequently the folks in the old home town are surprised when a child who occupied a humble role makes quite a mark in the larger world, although in many such instances a perspicacious adult might have predicted the outcome at an earlier time. Conversely, through shifting circumstances, persons who have made quite a splash in a limited environment may find that they cannot capitalize on their

past reputation in a new setting, and find it difficult to adjust gracefully to their lowered status.

Educational Implications. Such shifts are not the rule, but they suggest, among other things, that an educational policy which keeps the same pupils together from year to year under the same teacher and much the same educational program may provide a semblance of continuity and security at the expense of benefits that many individual children would gain from varied contacts with different groups of children in a variety of activities under teachers who differ in personality and use different practices. Needless to say, it is not possible to arrange matters so that every child is a leader. Many children and adults do not seem particularly to desire to assume direction of others as long as they can be left free to follow their own pursuits. Apart from desire, there are differences in ability to assume leadership. However, even though an individual may not aspire to leadership, he still seeks some measure of prestige or recognition. One mark of an able teacher and of anyone who deals competently with other human beings is the ability to draw out and to give recognition to the good qualities of persons with whom they deal, as far as circumstances permit.

Abilities of Leaders. Studies of the characteristics of leaders have generally indicated, as one would expect, that leaders are likely to be somewhat superior to the average member of the group in such traits as scholarship, intelligence, strength, motor skill, height, and physical appearance.²⁶ The superiority is likely to be most pronounced in the qualities that are most essential to the particular role of leadership that is played: leaders in athletics, for example, are likely to stand more above the average in athletic ability than in scholarship. Needless to say, there are many exceptions to this. Occasionally an individual will drive ahead to a commanding position in spite of ostensible handicaps, as when the person who begins with a speech defect moves on to be a linguist and an orator. Again, an individual may circumvent handicaps in one sphere

by gaining recognition in others. When such successes are achieved, they bespeak both a strong urge and the requisite underlying ability. Although leaders usually are abler than their followers, this is not always the case. Moreover, if a person far surpasses his associates they may fail to understand him and even persecute him for his superior qualities. Hollingworth describes the case of a child of superior intelligence who was ignored by his fellows in a class consisting mainly of average children and then speedily was accepted as a leader when he was transferred to a class in which the average level of intelligence was nearer his own (although still many points lower).²⁷

An individual of towering intellectual ability is unlikely to achieve a corresponding degree of leadership unless he has ingratiating qualities other than sheer intellect. Noteworthy in this connection are the findings in a study by Terman and Oden of the achievements of persons in their twenties and thirties who had first come under observation as gifted persons when they were children. Many of these bright youths had achieved outstanding positions, but some others, while maintaining their high level of intelligence, had failed to realize their intellectual promise. The findings obtained by Terman and Oden indicated that “. . . above the I Q level of 140, adult success is largely determined by such factors as social adjustment, emotional stability, and drive to accomplish.”²⁸ These investigators also point out that this does not mean that potentiality for achievement is the same for I.Q.'s of 140 as for I.Q.'s considerably higher than 140; rather, “The more probable interpretation is that we have not learned how to bring the highest intellectual gifts to normal fruition or how to steer them clear of the dangers that threaten personality development in extreme superdeviates.”²⁹ Sometimes, as Hollingworth has shown, the very possession of high intellectual endowments may entail boredom, impatience, and frustrations that precipitate the development of detrimental personality traits.³⁰ In order to realize his promise, the

individual with decidedly superior ability requires good aspirations and ambitions, and help in acquiring good ways of getting along with others, just as do lesser mortals.

THE EFFECT OF VARIOUS EDUCATIONAL PROCEDURES ON SOCIAL BEHAVIOR

In the foregoing, numerous references have been made to the manner in which environmental conditions may affect the character of a child's social behavior. A full treatment of this topic would go beyond the scope of this book, but some additional matters may be mentioned.

Nursery School and Camp Experience. In order to acquire the techniques of social intercourse, a child must, of course, have the opportunity to fraternize with his peers, must have a chance to learn to fend for himself in different circumstances without constant supervision by his parents, and to learn to adapt himself to people of varying personality. In studies of the effects of nursery school attendance, it has been found that the opportunities there afforded are likely to promote a child's ability to enter into social contacts with others and at the same time to promote his ability to assert his independence and to stand up for his individual rights. The effects of such opportunities will vary with different children, and in some cases no gains in social adjustment may appear. Moreover, as noted in a study cited at an earlier point, a child whose entry is delayed but who has had some opportunity to consort with others outside of school may within a relatively short time become as active in his social relations as are children of the same age who have attended for a longer period of time. However, if a child's opportunities to consort with other children are delayed, he will eventually be at a loss, especially if, in the meantime, he is not acquiring the skills and play techniques that are used by the group that he ultimately joins.³¹

Camp experience or other opportunities for acquiring independence away from home likewise has been found to be

of value to individual children, especially if they are over-protected at home and can be helped during the transitional period, or if, in their regular environment, they labor under handicaps that prevent them from developing their social potentialities. An illustration of this is provided in one study (by Lowenstein and Svendsen)³² in which a number of shy children from different localities were brought to a camp on a farm and were left free to follow their own devices. As time passed, the children showed notable changes in behavior; at first, they held themselves pretty much aloof, then they made contacts with other individuals, and then, as time passed, they entered into more extensive group activities, as their social activities expanded they also showed more of a disposition to be self-assertive. Many of the improvements in their behavior persisted after they had left the camp.

Influence of Skills. The effectiveness of provisions such as those mentioned above will vary with different children and in different circumstances, but it holds true in general that opportunities to learn and to exercise the many techniques that are involved in social intercourse, under good auspices, are an aid to good social adjustment, just as opportunities for practice are necessary for learning to ride a bicycle. Moreover, deficiency in specific skills, as was pointed out in an earlier chapter, may hinder a child's social development and block an adult's social activities, just as the acquisition of special skills frequently will have a salutary effect. In one study (by Jack)³³ children who were notably nonascendant in their dealings with others received practice in certain skills (such as piecing together a puzzle) and following this they were observed when matched with other children. It was found that in dealing with the situation in which they had acquired competence the children now expressed themselves more freely, were more self-assertive, less submissive, than before. In another study (by Updegraff and Keister)³⁴ a decline was found in "immaturity responses" (such as crying, showing a temper, asking for help) after children had received

instruction that helped them to learn how to help themselves. Needless to say, the acquisition of skill alone may fail to relieve deep-seated emotional difficulties that interfere with social adjustment, but in dealing with deficiencies in social behavior, as in dealing with fear, measures are likely to be most effective if they emphasize the learning of practical techniques.

Influence of Methods of Direction and Control. Most adults realize that a courteous approach usually works better in their dealings with other adults than do peremptory demands and dictator techniques. Requests that have a pleasant tone are likely to be more effective than scolding, positive prohibitions are more effective than threats, unhurried directions give better results than hurried directions.³⁵ In a study mentioned earlier (by Lippitt)³⁶ it was found that children of elementary school age responded more cooperatively to "democratic" than to "autocratic" techniques. When the former were used, the children were given a voice in the selection and planning of their activities and the adult tried to treat them in a man-to-man fashion. When the "autocratic" techniques were used the adult director made all decisions, gave very specific instructions, proceeded from one phase of the work to the next without informing the children of the plan as a whole, and made personal remarks instead of being objective in his praise. In the "autocratic" situations, the children showed more aggressiveness toward each other, more apathy toward the projects that were undertaken, and made less constructive use of the products of their work than in the democratic situation. Needless to say, the labels "democratic" and "autocratic" are somewhat misleading, for one could by definition include everything humane and good under the former term and stretch the latter to represent aggravating practices that no wise autocrat would use.

In observations of children in classes where "newer" educational practices have been in effect (permitting the children a greater amount of self-direction and opportunity for expressing their individual interests) it likewise has been observed

that children are better able to assume responsibility for their own conduct, at least as far as keeping order in the classroom is concerned, than sometimes is assumed by rigid disciplinarians.³⁷ Moreover, in this series of studies it was found that children who thus had more opportunity to assume responsibility for their classroom conduct surpassed the pupils from more rigidly controlled classes in self-discipline and socially acceptable conduct in certain out-of-school situations, such as on class visits to museums and other places of interest.³⁸

Problems in the Use of Democratic Procedures. Although, as suggested above, comradely and "man-to-man" procedures in an adult's dealings with children are likely to have a more salutary effect than unduly rigid and autocratic techniques, it does not follow that children, under the former regime, will proceed at once to work out completely democratic relations with one another. This has been noted in classroom situations in which the teacher has endeavored not to be a "dictator" but to give the pupils a good deal of self-direction. What frequently happens is that a small number of children take over much of the control that was relinquished by the teacher. In one series of studies³⁹ quantitative records were made of the extent to which the various pupils in a number of classes contributed to class discussion under different circumstances. It was noted, for example, that opportunities for all pupils to contribute to discussion and to get a hearing were more evenly distributed when the teacher was directly in charge than when a pupil chairman was in charge. Similarly, during "free discussion" it is likely that a small proportion of the pupils will preempt a large proportion of the talk (in a number of classes that were observed, one-fourth of the children did about two-thirds of the talking, and, in the median class, the number of "self-assertive, self-initiated, volunteered, supplementary or original" remarks or queries contributed by the most loquacious child equaled the combined contributions of the sixteen least loquacious children). Moreover, those who talked most were not uniformly the

children who were best informed or best able to contribute (the correlations between amount of talking and scores on various tests of knowledge and ability to reason were generally quite low). Many pupils seem to talk more by reason of a desire to be heard than by reason of their ability to contribute to the topic at hand.

Disproportions such as these do not necessarily mean that an unwholesome condition prevails. Many children are quite content to let others carry the burden of talk. It was found also that there were some groups in which those best able to promote the discussion were the ones who talked most. However, there also are pupils who say little but who would like to say more, as revealed by the fact that they raise their hands, make incipient attempts to talk, begin sentences that are interrupted by louder or more forward children.* Many teachers are quite aware of this situation and take various steps to cope with it. Able guidance from the teacher can help pupils themselves to become aware of the problem and to devise practical means of curbing inveterate talkers.

SUMMARY

During the first days of life the child shows little behavior that can be called "social," but from the beginning his everyday experiences and his daily survival are rooted in associations with other persons. Within a few weeks after birth he not only is the passive recipient of attentions from others but also is active, in his own way, as a social being. The widening of his repertory of social activities parallels and is interwoven with other features of his growth. Examples of

* It may be pointed out that this state of affairs is not, of course, limited to children, as anyone can testify who has attended committee meetings, seminars, or business meetings in the company of other adults. Informal records kept by the author of the study mentioned above indicate that, if anything, the talk in adult discussions is preempted by a few persons to as large an extent as is the case with children. A small proportion of the participants are likely to dominate a large proportion of the talk, just as in the economic sphere a large proportion of the wealth is controlled by a small percentage of people. It is interesting that a commodity so abundant as hot air should be monopolized so much.

such parallel developments are presented earlier in this chapter.

The development of a person's behavior as a social creature proceeds apace with the development of his status as an independent creature, distinct from others. As a child matures he becomes increasingly able to enter into various forms of "sociable" behavior, to cooperate, to join with others in common endeavor. At the same time he becomes increasingly able to express and assert himself as a unique individual. On the one hand, there is an increase with age in the interests and abilities that bring him into participation with other persons and their activities. On the other hand, as he grows older he becomes capable of various means of safeguarding and protecting his interests as an individual. In due time, he cooperates, forms friendships, and acquires, with the passage of time, some degree of sensitivity to the wants of others and some degree of sympathy with their concerns. Eventually also he becomes able to participate in complex teamwork, to develop loyalties on an extensive scale, to identify himself with the interests of a community or of a nation, and to be concerned with the welfare of the larger society of which he is a part. In varying ways and to varying degrees he also shows resistance, concern for his private interests and belongings; eventually he understands the idea of competition and devotes much thought and energy to the advancement or protection of his individual rights, as he construes them, and the advancement of his prestige. These "other-centered" and "self-centered" forms of behavior, involving, on the one hand, varying degrees of collective thought and action, and, on the other hand, varying degrees of self-assertiveness and individualism, are normal and complementary features of the child's social development.

There is an advance with age from the infancy-to the adolescent level in children's capacity for group behavior and for identifying themselves with group interests. According to available findings, however, it is not until the child has

reached the intermediate elementary grades that he is capable of teamwork on a complex scale. In the early elementary grades the child does not seem to be able to encompass intellectually, or to identify himself in a practical manner with the interests of a community as large as the enrollment of an average class, unless direct adult supervision is provided. As will be noted in more detail in a later chapter, children's contributions during class discussion at about the second grade level deal preponderantly with their own private experiences and concerns, and there is relatively little continuity or meeting of minds in these contributions. At about the junior high school level children's spontaneous contributions in class discussion show decidedly more preoccupation with the larger social affairs that occur in the community or in the world at large, and there is also more continuity as children contribute jointly to the development of a topic or theme as distinguished from independent testimonials from individual members of the group.

Developmental trends can also be noted in other aspects of social behavior. "Resistant" or "negativistic" behavior is displayed by practically all children, beginning sometime in the first year and reaching the peak by about the age of three and a half years but prevailing thereafter in varying degrees in years to come. Resistant behavior is a normal feature of social behavior, but it may be aggravated by unnecessary interferences and thwartings. Children also show varying degrees of aggressive behavior, most overtly during the pre-school years, and in more subdued ways during later years. Aggressive behavior may serve varying functions in different children. In the case of a child who has hitherto been shy and withdrawing a temporary display of aggressiveness may be a welcome and wholesome symptom of improving adjustment. Aggressiveness may be aggravated by techniques used by a child's elders and by restrictions that prevail in his general environment. There is some evidence to indicate that rigid and autocratic practices in dealing with children are likely

to precipitate aggressiveness (or apathy) to a greater extent than do less rigid, more democratic, man-to-man procedures. In this connection it also is noteworthy that limited evidence from studies of children's responses to "newer" educational practices indicates that children are more capable of assuming responsibility for their own discipline and good conduct than has been assumed in the more traditional and rigid educational program.

Aggressive, resistant, and other forms of self-assertive behavior frequently receive more notice and seem to be more conspicuous than cooperative, sympathetic, and friendly forms of conduct. However, research findings indicate that in the behavior of normal children friendly responses quite outnumber unfriendly responses. This is true even in the case of many children who are conspicuously incorrigible or refractory.

Shyness or "withdrawing" behavior is shown by many children in varying ways at different age levels. Apart from attention to factors in the child's everyday life that would have the effect of subjecting him to continued failure or of lowering his confidence in himself, there is much that can be done in school and in other group situations to aid the child to find his way by degrees into group activities through helping him to use and to improve skills or interests that he already possesses or through helping him to acquire the skills that are useful in social intercourse but which he happens to lack.

By the time they reach school age most children understand the idea of competition. In many occupations, especially those in which an individual's performance is rated or marked in terms of comparison with others, the average child is likely to exert himself more when working for individual honors than when working for the group. However, the child is likely to exert himself relatively more when working in behalf of a congenial group of his own choosing, or on group projects that enlist his interest, than when working with an arbitrarily designated group or on group projects that have been arbi-

trarily assigned. Competitiveness is encouraged by the adult practice of comparing children invidiously with one another and by emphasizing the importance of being a winner as distinguished from playing the game. School marks, grading systems, the practice of giving extraneous prizes and rewards may also tend to accentuate children's competitive activities. It may also be noted, however, that children's competition has value in giving zest to many activities, that many situations involve both wholesome cooperation and competition, and that under the spur of competition an individual's habits and his skills may improve in satisfying and wholesome ways.

In their own social groups children come to recognize, more or less explicitly, that various members of the group possess varying degrees of ability, popularity, and prestige. A child's position in the estimation of his fellows may, however, be out of keeping with his genuine worth. This situation arises if the group standards are influenced by prejudices that children borrow from their elders or if the values by which the individuals are judged are limited in such a way as to give emphasis to qualities that a few children happen to possess and fail to emphasize other qualities which may be of equal or greater importance.

Training for leadership is an important responsibility of education. Leaders among children usually are somewhat superior in ability to the average of the group, especially in the sphere in which they are recognized as leaders. However, ability alone is not a sole criterion of leadership. To be a good leader a child should also be able to be a good follower in the sense that he is responsive to the needs and wishes of his fellows and is able to participate whole-heartedly in their interests and concerns. If children of superior intellectual ability are to capitalize fully upon their potentialities for leadership it is important that they should have experiences that will help them to be socially acceptable to others.

Friendships or affinities between individuals are apparent from an early age in the social behavior of children. Friends

tend, in general, to resemble each other more than they tend to differ from each other in their abilities and in their personality traits, although there are many exceptions to this. The factor of propinquity, or nearness in geographical space, is, obviously, important in determining the range of individuals from among whom the children's friends will be chosen.

All children, in one way or another, desire some degree of recognition, acceptance, and prestige in their dealings with others. Frequently behavior that seems calculated to arouse hostility and to cause an individual to be rejected springs indirectly from difficulties that the individual encounters in his efforts to receive attention or some measure of approval. Even a bad child would like to be liked, and sometimes the punishment brought to bear upon such a youngster merely has the effect of augmenting the social distance between him and his fellows and of intensifying his unacceptable forms of behavior.

QUESTIONS AND EXERCISES

1. What features of child behavior illustrate the principle that "socialized" behavior and "individualistic" behavior are not antithetical but represent complementary features in the development of personality?
2. Compare the account of changes with age in group behavior as set forth in this chapter with the account of the contents of children's contributions in free discussions as described in Table V, Ch. VI. What parallels do you see? What are the implications of these developmental characteristics from the point of view of children's "readiness" for various topics that fall under the general heading of the social studies?
3. In the light of the discussion of boy-girl relationships at various age levels, what are the advantages and what are the disadvantages of coeducational classes or coeducational camps at the intermediate elementary school level, the junior high school level, and the high school level?
4. Give illustrations of ways in which forms of social behavior that we come to take for granted and to regard as "natural" actually reflect the culture and customs that have surrounded the child since his birth.

- 5 In the foregoing chapter, reference has been made to resistant, aggressive, and competitive behavior displayed at various age levels. To what extent, in your opinion, would these forms of behavior be much the same, and in what ways might they be quite different, if children were brought up in a society that had a political and economic system differing from our own? Consider this question from the point of view of the behavior shown at about the age of three years, eight years, fifteen years, and at maturity.
- 6 Under what circumstances would you regard a display of aggressiveness as a wholesome and encouraging symptom?
7. Make a list of enterprises that involve both competition and cooperation. Can you think of any activity or enterprise that represents "pure" competition (with no elements of actual or potential cooperation)? Can you name any enterprise that represents "pure" cooperation (with no discernible element of self-seeking or self-interest)?
- 8 List what you consider to be the values or benefits accruing from competitive behavior. List disadvantages or harmful effects.
- 9 What are some of the factors in a classroom situation that make it difficult to establish conditions that make for "free" competition?
- 10 What are some of the factors that aggravate competition and intensify the harmful effects that competitive behavior may entail?
11. List what you regard as important considerations in training children and young people to assume leadership. What are some conditions that block the development or emergence of potential leaders?
- 12 Describe ways in which, in your opinion, training and encouragement of everyday skills might help individuals to overcome handicaps in their social behavior.
- 13 The findings in several recent studies have been relatively favorable to "democratic" as compared to "autocratic" techniques in the management of pupils. What, in your judgment, are the limitations of these findings and what, in your judgment, are the practical implications of these findings for the teacher and the educational program?
- 14 In one study it has been noted that under some circumstances the more the class is relieved of autocratic direction by the teacher the more a few pupils tend to "take over" so that there may be even less equality of opportunity for the individual pupils.

than was the case when the adult was in charge. Is this result inevitable? What steps may a teacher and the pupils of a class cooperatively undertake to prevent this state of affairs?

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CHAPTER VI

Mental Development

This chapter will deal with various aspects of mental growth, the development of sensation and perception, imagination and reasoning. A later chapter will deal more specifically with the topic of intelligence and its measurement.

Some General Characteristics of Mental Development. The subject of mental growth is especially pertinent to the study of educational psychology, for a major portion of the emphasis in school has been centered upon learning of an intellectual sort. This is conspicuously the case in the schools that stress academic subject matter, but it also holds true, at the present time, in most schools in which newer and presumably more progressive theories have been put into effect.

As will be indicated in more detail in ensuing sections of this chapter, the changes that take place in intellectual functions as a child matures are so manifold that they cannot adequately be summarized under any single principle. In certain aspects of mental growth one can note a process of differentiation, refinement, and reorganization analogous to some of the changes that take place in motor development. In many aspects of his mental growth, the child's advance as he grows older consists not so much in the emergence of new responses as in an increase in the scope, or speed, or versatility which he displays in operations that functioned at an earlier time.

Increase in contact with more distant environment Although there are no discrete stages in a child's intellectual growth, it still

possible roughly to note certain trends or characteristics in the widening of the child's mental horizons as he grows older.

In the earliest infancy, the world to which the child responds consists largely of stimuli that arise within or impinge directly on his own body, the stimuli that occur in connection with hunger and feeding, and the contacts involved in his physical care. The world of sights and sounds does not have the prominence it will assume in time. It is not until some time after birth that the child consistently is able to fixate or follow a moving object with his eyes. With the passage of time, however, vision and hearing, which bring the child into contact with the more distant environment as distinguished from events that impinge directly upon him, come increasingly into play. Eventually vision comes to play so prominent a role in mental activity that in everyday speech we use visual terms to denote meanings that are not primarily visual in nature, such as "I see," as the equivalent of "I know" or "I understand."

Another aspect of the enlargement of the child's "mental world" consists in the development of ability to respond in terms of events that are remote in time as well as removed in space. The younger the child, the more his responses, his interests and preoccupations turn upon events that are immediate to his own experience or actually are in process of occurring. With advancing age, he is increasingly able to act in terms of associations with the past and anticipation of the future.

Increase in ability to employ symbols. A feature of this consists in increasing ability to respond to symbols or to a part of a vast total stimulus situation. Thus, certain responses that originally occurred only when the child actually was fed may be elicited simply by the sight of the bottle. The sound of preparations for feeding likewise arouses anticipatory reactions. After a toddler has had the experience of being dressed in the outdoors and then going for a ride, the mere sight of his mother approaching with his coat in her hand may move

him to smile, head for the door, and say "Car" in anticipation of a ride. This capacity to respond to symbols or reduced cues that originally were parts of a larger context and now function for the larger context appears in connection with all mental operations.

Along with this expansion through associations drawn from the past, there are many related phenomena. With the passage of time, the child becomes increasingly able to project himself into the future, to entertain plans or purposes that do not demand immediate realization, to work for deferred goals. He becomes increasingly able not only to respond to symbols or reduced cues, as noted above, but even to manipulate such symbols himself, to deal with abstractions as distinguished from the concrete. We see this, for example, when he is able to plan the itinerary of a day's hike by way of a map, or by "working it out in his head." Such "head work" substitutes to a large degree for actual "leg work" of an earlier day.

Although changes in the directions described above are associated with increasing mental maturity, they do not occur in an all-or-none fashion. At a given age, for example, a child may show "thought before action" in his use of a hiker's map but not in the construction of a wooden box; he may show a high degree of refinement and precision in his use of words but produce crude drawings that betray a lack of perception of detail; he may persevere over a long time to procure a desired stamp for his collection but abandon another project when its execution is slightly delayed.

Continuity and Stages in Mental Growth. Although changes such as those mentioned above are associated with increasing maturity, there are no distinct stages in mental development in the sense, say, that a child passes from a clearly demarcated stage of preoccupation with the immediate and concrete to a stage of preoccupation with the remote or the abstract. Nor does he move from a definite stage when he is naive and irrational to a stage when he is a rational and

logical creature. There is not, for example, a period during the preschool and primary school years when he is capable only of responding to a "Peter Rabbit" or fanciful approach in the study of natural history, as distinguished from a later stage when he can take his science "straight." This point will be considered again in a later section.

Early sensory exploration. Mental development cannot be described in terms of distinct stages, but it remains true, of course, that certain features of behavior and certain developmental trends are more conspicuous at one mental age level than another. Thus, the first months of life represent a period when there is especially rapid development of sensory functions and their effective use. During the first year, likewise, the child gives much attention to exploring sensory objects, mouthing them, tasting them, lifting them and examining their texture by way of his hands. Sensory exploration of this sort continues to be conspicuous for some time after the first year, as does attention to the shape and size of objects. Similarly, beginning during the first year and becoming especially prominent during the second, there is a period of preoccupation with the use of language, appearing first in the vocal grunts, babblings, and use of varying sounds and inflections, reaching a milestone (as far as the adult observer is concerned) in the child's "first word," and continuing long thereafter. Other landmarks may be noted, such as the beginnings of make-believe, coinciding roughly with the development of spoken language (although sometimes appearing in overt pantomime before the child is able to talk), and flourishing especially in connection with his play activities for several ensuing years; and the beginning of the "questioning age," at about the age of three, when the child plies his elders with who's, what's, and why's that seem to spring from a lively curiosity, not unmingled with a desire for attention.

Other identifiable trends in the continuity of development. The forms of behavior mentioned in the above illustrations do not, of course, suddenly emerge or suddenly disappear; they simply

represent a few of the identifiable features involved in a continuous and more inclusive series of developments. During the late preschool years, and throughout the years that follow, other features may be noted. Varying in time and intensity in the case of different children, there may, for example, be outcroppings of shyness that seem to betoken a degree of self-awareness that did not prevail at an earlier time. On a larger and more universal scale, certain intellectual interests are prominent at given age ranges, such as the almost universal interest shown by children in our culture in vicarious and rather melodramatic adventure in the age range from about five to twelve, and the appearance at the time of puberty of interest in romantic themes that were rejected (by boys) at an earlier time.

Varying also in the case of different children, there may come spurts in various interests and activities such as reading, preoccupation with jokes and riddles, and various forms of horseplay. A previously unnoticed or less inconspicuous desire for privacy may emerge, or for the sharing of secrets and passwords with other children. A seeming self-consciousness with respect to expressions of affection or to various forms of parental protection that were readily accepted at an earlier time may appear. With respect to manners and etiquette, the child may begin to attend to details of personal appearance and grooming, and details in the behavior of his parents or the management of his home that previously received little notice. Likewise, in the case of the individual child, there may come periods when ideas and insights, previously in process of formation, seem suddenly to take hold.

The sections immediately following will deal in more detail with various manifestations of mental development. The discussion will center upon a number of topics. These topics do not represent distinct or unique intellectual operations. A complete treatment of any one of them would embrace practically the entire subject of mental growth. Rather, the topics serve as convenient means of organizing the discussion

and of describing various phenomena that are of interest from an educational point of view.

• SENSORY AND PERCEPTUAL DEVELOPMENT

From the time when a child is born there are multiplying signs of his growing sensitivity to stimuli that impinge upon his sense organs. Although it is difficult to obtain systematic evidence concerning the keenness of a child's senses, experimental study as well as ordinary observation indicate that children attain a relatively high degree of sensory acuity at an early age, as indicated, for example, by their response, within a few months after birth, to small visual objects, light contacts with the skin, differences in the taste of articles of food, certain relatively faint sounds (such as the swish of milk as it is shaken in an unseen bottle). Precise measurements of sensory acuity in terms of the norms that eventually can be obtained through standard tests (such as tests by means of an audiometer) are not easily obtained, since it is difficult to hold a young child's attention and to be certain that he understands the directions and gives the appropriate signals. However, by the age of about three years, if not before, a child has progressed relatively far toward his maximum in sensory acuity. At this age he also has made marked strides in his use of the data of past and present sense impressions in connection with operations that go by such names as perception, reasoning, imagination. But the difference between him and the mature adult is relatively greater with respect to these latter operations than with respect to sensory acuity as such.

Evidences of Differentiation. From the time when a child is born an almost limitless barrage of sensory stimuli pour in upon him. If he responded similarly to all, his experience would, of course, be rather chaotic and "meaningless." Almost from the time of birth it becomes evident that his response to events is influenced not simply by the sensory stimulus as such but by the effects of past experience. This takes place before the child gives signs of awareness as to how

these associations are formed, and long before he is capable of formulating past experiences in terms of recollections that he can report. Thus, at the age of six months or earlier, a child may respond in an adaptive manner to the swish of milk (as in the illustration above) or to the sound of a cereal being stirred or to the sound of an electric switch on the heater used to warm his food, but show no such definable response to a variety of other sounds of similar intensity.

In the development of perception the child may at any given time exhibit varying degrees of differentiation and of generalization. Thus, at fifteen months a child for the first time gave signs of being able to recognize an unseen dog by its bark: he mentioned the dog's name at the sound of barking outside the house. For a short time thereafter, however, he also mentioned the dog's name in response to certain other outside sounds, such as the "scolding" of a blue jay; at a later time, in turn, the sounds of birds were distinguished and identified with a "bih," the child's version of "bird." In time, the same child would be able, if occasion offered, to discriminate more or less accurately between the barking of different dogs and the singing of different birds.

In the course of development, likewise, there not only is an increase in the range of events or phenomena that are discriminated in a meaningful manner, but there is also an increasing ability to respond to details or nuances associated with a given phenomenon. This can be noted, for example, when the child responds not only to the human face as distinct from other objects, or responds in a discriminating way to different familiar faces and to these as distinguished from the faces of strangers, but also shows increasing responsiveness to changes in the facial expressions of the same person.

Progress in response to detail can be noted also in the child's perceptual-motor behavior, such as in his drawings, which, at the start, tend to be in the nature of gross representations (if they can be identified at all) and then take on more detailed features and proportions.

Later Trends in Auditory and Visual Acuity. In the development of visual and auditory sensation there occur the phenomena both of growth and decline. Figures 6, 7, and 8 illustrate these phenomena in graphic form on the basis of tests of males at various age levels. Beginning before the age of twenty there is a falling off in hearing as measured by the highest pitch that the individuals were able to hear

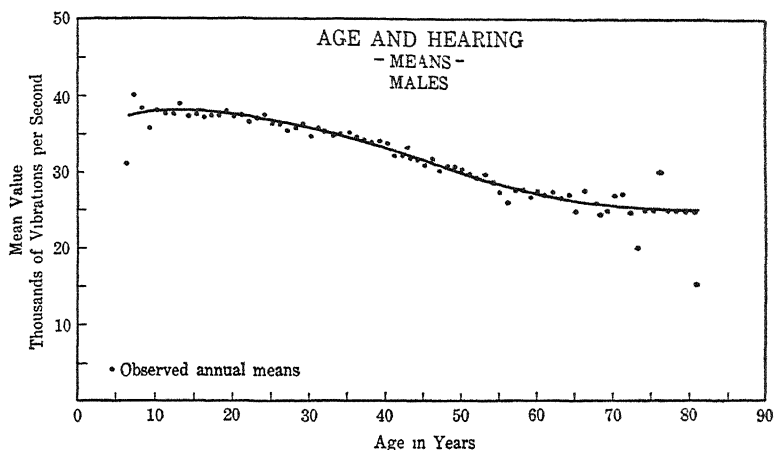


FIG. 6. AGE AND HEARING AS MEASURED BY THE HIGHEST AUDIBLE PITCH (IN ONE THOUSAND VIBRATIONS PER SECOND)

(Based upon mean values reported by H. A. Ruger, "On the Growth Curves of Certain Characters in Man (Males)," *Annals of Eugenics*, 1927, 2, Parts I and II, p. 85)

(see Fig. 6). Visual acuity, as measured in the values represented in Fig. 7 in terms of the greatest distance at which individuals can read diamond type, begins to taper off at about the age of twenty and declines quite sharply after forty. For purposes of comparison, one other curve is shown in Fig. 8. This shows the mean error at various age levels in trisecting a line, an example chosen to represent perceptual judgment as distinguished from sensory acuity. The curve shows an improvement up to the age of about twenty and little or no change thereafter.

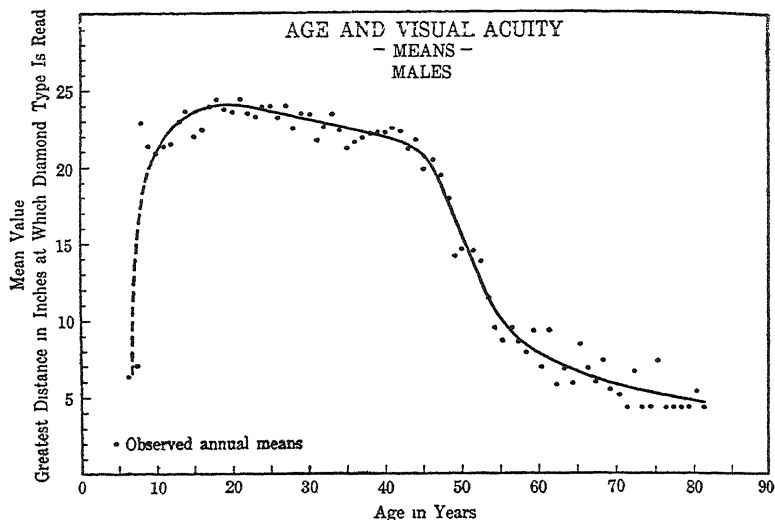


FIG 7. AGE AND VISUAL ACUITY AS MEASURED BY DISTANCE IN INCHES AT WHICH DIAMOND TYPE CAN BE READ

(Based upon mean values reported by H A Ruger, "On the Growth Curves of Certain Characters in Man (Males)," *Annals of Eugenics*, 1927, 2, Parts I and II, p 85)

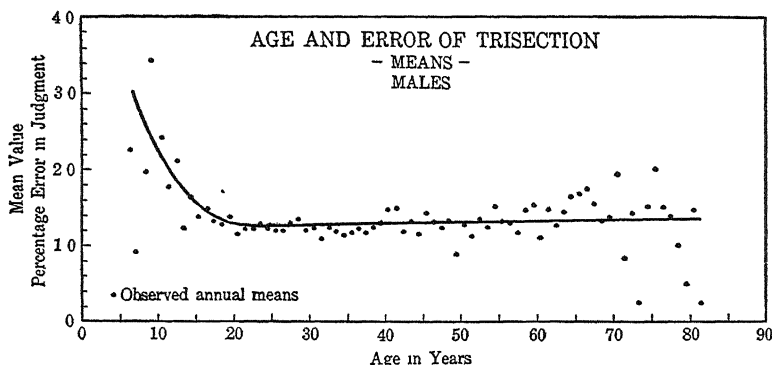


FIG. 8. AGE AND "PERCEPTUAL JUDGMENT" AS MEASURED BY MEAN PERCENTAGE OF ERROR IN TRISECTING A LINE

(Based upon mean values reported by H A Ruger, "On the Growth Curves of Certain Characters in Man (Males)," *Annals of Eugenics*, 1927, 2, Parts I and II, p. 85.)

Increase in Speed of Overt Perceptual Responses. In connection with many reactions, there are gains as a child grows older in the speed with which he can react verbally or make a motor response to what he perceives. In speed of naming colors (as tested by a sheet containing rows of colored squares) seven-year-old children, even when they are perfect in their ability to identify and name colors, require about twice as much time as do college students. In like manner, at the age of four years, the average child is able to discriminate quite accurately between a number of geometrical forms, such as a circle, square, triangle, cross, diamond, but when called upon to place such forms into their appropriate slots in a form-board as rapidly as possible, the child is likely for some years to come to show further increases in the speed of his performance.

MEMORY

As already pointed out in earlier sections, evidence of the influence of past impressions can be noted almost from the time of birth. As time passes, there is not only an increase in such manifestations, but also increasing evidence that the child himself is aware of details of past experience and is able to formulate such details and to act upon them in concrete ways.

One of many manifestations of the development of memory is the ability to act in terms of a stimulus that no longer impinges upon the sense organs. An example of this occurs when a child continues to gaze for a moment at the door through which a person has disappeared, or makes searching movements to retrieve a rattle that has fallen out of sight. By the time the child is a year old, he may be able to resume a project even though his attention has been distracted for several minutes, and, in individual cases, it has been noted that a child may react in terms of a momentary impression even after the passage of many weeks, as when, on a visit to a relative's house, he goes directly to the drawer of a certain

bureau into which, on an earlier occasion, a box of crackers had been placed while he looked on.

Early Memories. The amount that an individual learns and remembers in the course of intellectual development is quite staggering to contemplate, but quite as impressive is the volume of experiences that engage his attention for a time and then are forgotten. In his daily behavior, the young child manifests numberless recollections that persist over a period of days or months but cannot be recalled when, at a later stage of growth, he is asked to report his memories of early childhood. In the case of the average person a huge proportion of childhood experiences during the first years of life, including many that seemed to be important at the time, are lost in oblivion. When older children and adults are asked to report their early memories, a few will claim that their earliest recollection goes back to the first year of life; some will report events that occurred during the second year; but a majority will not recollect anything that happened until the age of three or later. Such recollections are likely to concern a few striking episodes and to reflect only to a slight degree the happenings and experiences that molded the child's habits and attitudes from day to day, and that may influence his present behavior in definite ways that he is at a loss to understand.¹ This inability on the part of an older person to rehabilitate his own childhood is one of the many factors that make it difficult for an adult either to understand himself or to put himself in a child's place and to judge the child's world from the child's point of view.

This phenomenon of forgetting continues, of course, throughout life (rather fortunately, as a matter of fact), but the obliscence of past experience does not occur on as whole-sale a scale after about the third or fourth year as is the case before that time. Needless to say, many factors contribute to this, such as changes associated with the maturation of the nervous system, and the development, through the influence of maturation and learning, of the ability to formulate past

experiences in terms of language. At any period of development, the experiences that are most likely to be remembered are, of course, those that either made a striking impression at the time or are related to an individual's interests and goals. Thus, a boy who has raised a pig for sale may remember the market quotations published on the date of the sale long after he has disposed of the pig, and at the age of eighty he may still remember this detail.

Memory of Pleasant or Unpleasant Events. Reports by adolescents or adults of their "earliest memories" usually show a large proportion of unpleasant events that were especially striking or unusual at the time. In the everyday process of forgetting, however, it has been found in studies of both children and adults that unpleasant happenings are less likely to be recalled than are pleasant happenings. For example, if a number of persons report the pleasant and unpleasant events that befell them during a given preceding period and then, two or three weeks later, are asked to give a similar report for the period in question, it is likely that the second report would include a larger percentage of the items on the first list of pleasant events than of the items on the first list of unpleasant events.² Individual persons may, of course, go counter to this. There are individuals who, by reason of various circumstances, are chronically more disposed than others to recall the unpleasant. In the life of any individual, likewise, there may be periods when unpleasant events are prominently recalled.

This phenomenon of greater recall for the pleasant has variously been described as indicating a tendency toward the "obliviscence of the disagreeable" or "the optimism of memory." Many factors, which need not be listed here, seem to be responsible for it. In general, this phenomenon represents a rather fortunate state of affairs, even though occasionally a person might better be able to understand and to cope with his present mode of living if he had clearer recollections of unpleasant events of the past.

CAPACITY FOR SUSTAINED ATTENTION

A notable accompaniment of increasing mental maturity is an increase in the ability to give sustained attention to a topic or project. In early infancy, a child's periods of concentration are fleeting (except in connection with physical needs, such as feeding). As his repertory of responses widens, there is also an increase in the length of time during which he devotes attention to a given activity or object, but the time varies considerably according to his inclination. In the age range from two to six years, there is a steady increase from year to year in the duration of periods of continuous attention during children's free play. In one study (by Gutteridge)³ conducted in nursery schools and kindergartens, the average amount of time spent continuously or with only momentary interruptions on projects undertaken by the children rose from 9.4 minutes at two years to about 19 minutes at four years, and to about 24 minutes at five years. In other studies the length of time devoted to continuous use of certain play materials has been found to rise with age during the preschool period.^{4,5} At all age levels wide variations are, of course, exhibited by different children and by the same child at different times. On occasion, a child of preschool age may devote himself to a project for a period of an hour or more, and then on other occasions he may flit from one enterprise to another every few minutes. Even so, the averages definitely show an increase with age in the time a child will concentrate upon a project of his own choosing.

At the elementary school level and beyond, differences between individual children may be so marked that it readily appears that one child is characteristically showing more staying power than another, but by reason of differences in work habits and the difficulty of determining whether a child who sits and watches actually is idling or is concentrating on his work, precise measurements are difficult to obtain in the case of the average run of children. Moreover, a child's

display of sustained attention will vary also in connection with different projects, and with the ability of the teacher to hold his interest. His concentration span will be longer in connection with projects of his own choosing than with projects that are arbitrarily assigned; it is likely to be longer when he is competing with another child, or is working with a friendly adult, than when he is occupied alone.

The tendency of children of elementary and high school age to wander from one half-done task to another sometimes causes concern to their parents and teachers, and may provoke a good deal of nagging. The relationship between ability to persevere on various tasks in childhood and persistence of effort in adult years has not been studied systematically. It is apparent, however, that a display of wandering tendencies in connection with assigned tasks during childhood does not necessarily mean that the same tendency will appear when the individual is occupied with his own plans and ambitions as an adult.

By reason of complications that make it difficult to obtain systematic findings, no definitive recommendations can be made concerning the optimum length of class and study periods in different school projects at various age levels. This is particularly true of projects which the children themselves have selected or which are of special interest to them. Judging, however, from observations of the spontaneous behavior of children at the late kindergarten stage, it appears that a systematic policy of extending recitations, drills, study periods over unrelieved periods of half an hour or more is likely to tax the staying powers of the average first grade child.

LANGUAGE DEVELOPMENT

As already suggested in earlier sections, much of what we know concerning a child's intellectual development is revealed through the medium of language. The subject of language cannot strictly be set apart from other topics dealt with in this chapter, but special attention to certain aspects of language

development serves as a convenient means of discussing many features of mental growth.

Early Language Responses. The child's first vocalizations include a large repertory of sounds, varying in pitch, timbre, and loudness. At the start, much of his vocalizing is in the form of cries that occur in connection with general bodily activity and that seem to signify hunger or discomfort, but even during the first days of life children use many sounds other than those involved in crying, such as grunts and vocal yawns.⁶

A child uses vocalizations as a means of social communication long before his own ability to articulate words has been established. Various inflections and intonations resembling those of adult language, and expressive of delight, anger, disgust, appeals for attention, scolding, and warning, have been noted several months before the appearance of the first word. The child likewise responds to the language of others long before he can use words himself. In such early responses, the tone and inflection of what is said to him have more meaning than the precise words that are spoken.

The Beginnings of Spoken Language. There is wide variation among children in the first use of words. Generally speaking, bright children tend to be more precocious than do dull or average children in the beginning of speech, but even among children of similar intellectual promise there may be a difference of several weeks or months. It is difficult to state an exact time when the "average" child begins to talk, not only because of such individual differences, but also because of difficulties in detecting and interpreting the "first word."

Growth in Vocabulary, Loquacity, and Articulation. After they have spoken their first word or two, children do not always proceed forthwith to make tremendous strides in the acquisition of new words, but as time passes, the eventual gains are, of course, enormous. In one study it was found that the average vocabulary was three words at one year and 2562 words at six years.⁷

Once a child has begun to use words freely, it is practically impossible to obtain an exact measure of the size of his vocabulary. At all ages, the number of words that a person can understand when he hears or reads them surpasses the active vocabulary that he has at his own command.

After a child has learned to talk, the increase in his loquacity tends to be higher than the increase in his vocabulary. In one study it was found that in the period from two to four years, children showed a four- to fivefold increase in the total number of words spoken (including repetitions of the same words) per unit of time in the nursery school and kindergarten, as compared with a little over a threefold increase in number of different words used.⁸ The relationship between verbosity and size of vocabulary has not been studied systematically at later levels, but from everyday observation one can gather that an individual's tendency to talk much or little is influenced to a large degree by factors other than the possession of a good vocabulary or of anything especially important to say. As pointed out in an earlier chapter, there may be little or no relation between the amount of talking children do in class and the amount of knowledge or intelligence they possess. Perhaps the same holds true also, by and large, in the case of older persons.

Use of Phrases and Sentences. The average length of a child's remarks increases steadily throughout the preschool years and beyond. By the time a child reaches school age, simple sentences predominate, but as he advances toward high school he approximates more and more the professorial custom of using many complex and compound sentences. An indication of changes with age in the length of sentences is shown in Table V.

Gains in Knowledge of Word Meanings. Increases in vocabulary, articulation, and sentence length represent only a small feature of the growth of language ability. Quite as important is the gain in precision in using words, the ability to select terms and phrases to denote different shades of

meaning and to recognize the varied denotations and connotations of words. This process of using terms with increased discrimination and of acquiring wider knowledge concerning the meaning of given words is never completed — it continues as long as the individual continues to live and learn.

TABLE V

AVERAGE NUMBER OF WORDS PER REMARK AT DIFFERENT AGE LEVELS *

| <i>Age in Years</i> | <i>Average Number of Words</i> | <i>Age in Years</i> | <i>Average Number of Words</i> |
|---------------------|--------------------------------|---------------------|--------------------------------|
| 1½ | 1 2 | 4 | 4 4 |
| 2 | 1 8 | 4½ | 4 6 |
| 2½ | 3 1 | 5½ | 4 6 |
| 3 | 3 4 | 6½ | 5 3 |
| 3½ | 4 3 | 9½ | 6 5 |

The fact that an individual uses a word in his spoken vocabulary is no guarantee at all that he understands the word in all its varied meanings, or even that he understands the meaning that is intended in a given context. This fact complicates the teaching of concepts at all age levels. It often happens that an instructor erroneously infers from a pupil's use of a term that the pupil actually knows what it means. More often, the instructor falls into the error of assuming that terms he uses will have the same meanings for his pupils as they have for him. In a history class, for example, a teacher may speak of Benjamin Franklin's work as a *minister* to France, and in response to questioning, a pupil may correctly respond that Franklin was a minister to France when actually several pupils are thinking of a minister as a clergyman.¹⁰ Again, a child may be slow in learning to differentiate the multiple meanings associated with a given word. Thus, a fifth-grader answered that a relief map brings relief and another reported that there are two kinds of corn, sweet corn and Capricorn.

Although misconceptions concerning the meaning of words

*Adapted from D. McCarthy, *The Language Development of the Preschool Child*, and E. A. Davis, *The Development of Linguistic Skills in Twins, Singletons with Birth Order and Only Children from Age Five to Ten Years*.⁹

sometimes are quite bizarre in their literalness, they more often involve associations that are relevant even though incorrect (as when a child, in response to questioning after he has reported a news item concerning the lifting of an arms embargo, states that the arms embargo is some kind of gun). Needless to say, there is no simple way in which the full meaning of terms used in school subjects can be impressed upon pupils once and for all, for it is only through meeting a given term in various contexts that a person can learn its various meanings. However, there are practical measures that a teacher can take to deal with this problem. One major consideration is to be on guard against taking too much for granted. In numerous studies it has been found that pupils are quite hazy about terms that they are frequently exposed to and which they presumably should know. Moreover, the fact that a child can define such terms according to the book or by means of a teacher's words or examples gives no accurate indication that the meanings are clear. One procedure that serves both to reveal the child's degree of understanding and to overcome lack of understanding is to ask him to use or define words in terms of concrete situations with which he is familiar ¹¹

Influence of Environmental Factors on Language Development. Needless to say, it is only by having an opportunity to hear and to use the words of a given language that the child can learn the language, but his ability to profit from such opportunities to learn will vary with his degree of maturity. The fact that a child's response to language stimulation is influenced by his own growth is shown in a study (by Strayer)¹² cited in an earlier chapter, in which early training was given to one twin for a period of six weeks, beginning at the age of eighty-four weeks, while the other twin was kept in a nonverbal environment. At the end of the period of six weeks, the child whose training had been deferred made comparatively rapid gains, and within a short time the two children showed little difference in the size of their vocabularies.

Although special stimulation and training do not transcend

the limits set by the child's own growth, it also is true that the extent to which a child utilizes his abilities will be influenced by his environment. After a child has acquired the ability to talk, his progress will be affected by the stimulus provided by his associates. A child who has a good deal of opportunity to associate with older children, and especially with educated adults, is likely to have an advantage over a child who is limited to associates of his own age or younger. Thus twins who spend a good deal of time with each other may be somewhat backward in their language development as compared with "singletons" who fraternize relatively more with adults or older children; children who live in homes of low social-economic and educational status, or in a notably unstimulating orphanage situation, may fail to realize their potentialities as compared with children whose home situations are more favorable ¹³

The child's environment likewise will have a notable effect upon his learning of correct pronunciation, good usage, and correct grammar. The youngster who is exposed to good language usage in his everyday life learns a great many of the countless details of such usage effortlessly and as a matter of course, while the child whose daily associates are relatively illiterate must exert special effort to displace his customary speech habits with the forms required at school. By reason of differences in past training, the same exercise in grammar and composition may be quite easy for one child and quite difficult for another youngster of similar intelligence. Occasionally, of course, a child who knows the correct forms will deliberately violate them and sprinkle his speech with double negatives, and items such as *ain't* and *them is*. Such behavior may be a form of word-play, or it may be a form of resistance to get a "rise," or, as sometimes happens, a child will knowingly commit errors in order to conform to his group or to avoid the charge of being a sissy.

The necessity of adjusting to two different languages in a bilingual environment may also retard a child's progress in

either of the two languages for a time. In the long run, however, exposure to two languages is not likely to handicap a child's language development and intellectual progress to any material degree unless other disturbing factors enter in. In individual cases, the command that is gained of two languages may be quite advantageous.¹⁴ Apart from any language handicap that may prevail, unfavorable effects may, of course, occur if the child who is called upon to adjust to two languages is regarded as an alien by his associates or teachers and is subjected to ridicule or ostracism, although such is the resiliency of a sturdy child that his endeavors to overcome a hardship of this kind may eventually serve to his advantage.

Relation to Social and Emotional Adjustment. A child's emotional maladjustments may also have a bearing on his language development. Refusal to talk is sometimes found as a feature of negativism and resistance, or of extreme shyness, in a child's relations with others. Frequently, however, a child who thus keeps his mouth shut may still keep his ears open and show that he can wield a good vocabulary when he is moved to speak.

Acquisition of Vocal Mannerisms. Quite apart from the factor of size of vocabulary and knowledge of correct usage, an individual's effectiveness in the use of spoken language will be influenced by his manner of speech, his diction, the pitch, loudness, and modulation of his voice. The process by which a person adopts or rejects various speech mannerisms and eventually acquires his own characteristic quality of voice and mode of speech has not been studied systematically. It is possible frequently to observe the effects of the immediate environment on a child's mode of speech, as when, for example, constant competition with other children for the attention of his elders, or difficulty in obtaining a hearing by reason of parental impatience or preoccupation, seems to dispose a child to speak hurriedly and loudly. Likewise, a person may chronically exhibit strident or whining voice qualities that are in keeping with other features of his general personality,

but at no age does the voice alone supply a reliable clew to an individual's personality. Again, a child may for a time adopt "cute" tonal mannerisms that have been applauded by his elders. Although a person can never be conscious of the quality of his own voice, or hear it as others hear it, many individuals at various times during childhood and adolescence, and again at maturity, take note of their mode of speech, and sometimes a child will experiment with the tempo and cadence of his speech and practice to establish a given effect. Although the physical makeup of the speech organs plays an important part in determining the characteristic quality of an individual's voice, the quality of speech is influenced to a large extent by chance or deliberate habit formation, and the potentialities for modification through example and training are enormous.

There is, of course, no guarantee that speech mannerisms acquired during childhood will carry over, intact, into later years, especially in the case of boys who have a "change of voice" at puberty. A systematic study of the speech of adults as related to childhood speech would no doubt, however, show a tremendous carry-over and no doubt would emphasize that a relatively small amount of attention to voice culture by the parents and teachers of young children would accomplish more than a much larger amount of instruction and drill at maturity.

CONTENTS OF CONVERSATIONS AND DISCUSSIONS AT VARIOUS AGE LEVELS

Although the topics talked about by persons at different age levels are practically universal in scope, certain distinctive age trends can be noted. The younger the child is, the more likely it is that his conversation will dwell upon his own immediate experiences. The use of "I" and "my" looms larger in his language during early years as compared with later periods (although "I" was a high score throughout life).

In one study in which snatches of the conversations of college women, and of a group of unselected men and women,

were surreptitiously recorded, it was found that remarks of the "ego-related" sort constituted 40.7 per cent of the statements that were recorded.¹⁵ Women seem to exceed men somewhat in the relative frequency of remarks of this sort, while men exceed women in remarks concerning conditions or events that involve no direct personal reference.

When free to select their own topics for discussion in the classroom, notable differences appear in the contributions of children in the later elementary grades as compared with the earlier grades. Table VI shows results of an analysis of records of children's contributions in such discussions. At the sixth grade, as compared with the second, there is a good deal more preoccupation with remote rather than immediate happenings, with abstract topics and world events rather than with personal experiences. There likewise is a greater meeting of minds, with contributions by several children on a given topic or issue, as distinguished from the large proportion of disconnected items reported by children in the earlier grades.

DEVELOPMENT OF CONCEPTS AND REASONING

The reasoning processes of children and adults are essentially similar, but there are, of course, many differences in the problems that concern an individual at different periods of his growth and the resources he has for solving them. As mentioned earlier, the younger the child, the more preoccupied he is with his own immediate concerns. The younger child also lacks the language facilities for phrasing his thoughts and conclusions in adult terms, and he inevitably lacks the store of relevant information and experience that an older person has. He also has less capacity for long periods of concentration and for the marshaling of relevant evidence in dealing with a complex problem. In matters that do not directly concern him, he is likely to be less responsive than is an older person to social demands for self-consistency, and in dealing with new problems he is likely to be more precipitate than is an older person in resorting to trial and error

TABLE VI

CHILDREN'S CONTRIBUTIONS DURING "FREE DISCUSSION"
PERIODS IN THE CLASSROOM

Each group of entries shows the percentage of contributions at Grades II, IV, and VI that fell into various categories when analyzed from different points of view *

| <i>Grade</i> | <i>II</i> | <i>IV</i> | <i>VI</i> |
|--|-----------|-----------|-----------|
| <i>Number of pupils</i> | 62 | 54 | 45 |
| Relation of pupils' contributions to remarks made in the preceding discussion | | | |
| "New topic," no logical continuation of what has gone before | 87 | 33 | 23 |
| "New topic," not directly related to previous material but apparently suggested by previous contributions | 8 | 24 | 33 |
| Continuation of a previously introduced topic or theme, further discussion of topic already introduced | 4 | 43 | 44 |
| Subject matter of contributions | | | |
| Personal activities, experiences | 61 | 41 | 18 |
| Animals | 10 | 7 | 8 |
| References to books, radio programs, movies (other than content of current news) | 7 | 13 | 6 |
| Current happenings, events, activities of people other than contributor (world and domestic news) | 18 | 29 | 60 |
| Miscellaneous | 4 | 10 | 9 |
| Locale or place referred to in matter discussed | | | |
| Immediate physical environment | 84 | 55 | 27 |
| Remote locality (<i>e g</i> , submarine sunk at sea) | 15 | 41 | 71 |
| No definite or implied reference to place or location | 1 | 4 | 2 |
| Medium, agency, or channel through which contributor acquired the material or information contained in his contribution | | | |
| Personal presence, direct contact with event described | 83 | 52 | 25 |
| "Reflection," process of mental association (as in expressions of opinion, questions, elaboration of another's remarks, etc) | 1 | 15 | 18 |
| Other media, persons, or agencies (conversation, reading, radio, etc) | 16 | 31 | 56 |
| Undetermined | 0 | 2 | 1 |

The young child's reasoning often appears to be naive and inconsistent; his answers sometimes betray what appears to

* Adapted, in abridged form, from Harold V. Baker, *Children's Contributions in Elementary School General Discussion* ¹⁸

be a lack of ability to reason from given premises, to comprehend cause and effect, and to weigh and criticize his own conclusions. It has been proposed by some writers (notably Piaget)¹⁷ that there are basic differences between the reasoning processes of young children and older persons: that before the age of about seven or eight years a child is unable to think from the standpoint of a general proposition or another's point of view, is incapable of carrying on a genuine argument with others or examining the validity of his own conclusions. Actually, however, it has been found in numerous studies that there are no distinct stages in the development of children's thinking and no fundamental differences between the thought processes of children and adults. A child is likely to be naive and inconsistent, to be sure, but when adults are confronted with unfamiliar problems they make much the same kind of mistakes as does a child.¹⁸ Give him a problem that ties in with his own information and experience, and he will use good logic within the limits of his understanding and patience.

Concepts of Cause and Effect. One approach to the study of children's thinking has been to present a variety of problems at various age levels and then to compare the kinds of answers that are offered. The children are shown, for example, a lighted candle which goes out when a jar is placed over it, or a beaker of water into which a pebble is dropped, causing the level of the water to rise, and are asked to explain what happened. Likewise, they may be asked questions as to what causes the clouds to move or trees to grow.¹⁹ In studies of this sort it has been found that a variety of types of answers are given by children at all age levels. In studies of English-speaking children, most of the children at all ages from the kindergarten to maturity answer in terms of physical or mechanical causes, rather than in terms of magic, animism, or other mysterious forces. As children grow older, there is an increase in the number of problems for which they have adequate answers, but answers that are logical and scientifically plausible appear at all age levels in response to problems

that lie within the child's grasp. It has also been noted in studies such as these, as well as in others, that a child may offer a logical and correct answer to some questions and then answer quite illogically to other questions on which he is not so well informed or which he is not concerned about.

Capacity for Inductive and Deductive Reasoning. Another approach, among many, that has been employed to study the nature of children's reasoning has been to present them with problems that call for inductive or deductive thinking. In such studies it has been found that children of beginning school age are able to detect logical fallacies and to arrive at a generalization from given particulars, or to select from a number of alternative solutions the one that is compatible with all the given facts²⁰ Needless to say, a child is likely to solve certain problems of this sort and fail to solve other problems in which the particulars are more complex and the solutions more obscure. Likewise, he may fail to solve a problem that is relatively simple but is on quite unfamiliar ground.

Practical Implications. The implication of findings such as those reviewed above is that an educational program should not be planned on the theory that there are distinct stages in the development of children's reasoning or that the child should be approached more as an irrational creature or rote learner at one age level than at others. There still remains the problem as to how the educational program might best be adapted, in quite concrete ways, to children's interests and their store of information.

Available information concerning the growth of understanding during childhood does not provide a basis for a detailed prescription as to when and how various generalizations and concepts should be taught in order best to conform to the child's own mental development. Even with further advances in knowledge concerning the mental development of children it is unlikely that detailed prescriptions ever can be made, unless they are laid down quite arbitrarily. The

child does not become ready for a given idea or line of thought at any one particular time; there are wide individual differences between children at any given age; and children of similar intelligence and general ability will differ in the background of experience and concrete information that they bring to a given topic. Although this is recognized, there are several findings concerning the development of children's information and concepts, their ideas of time, space, and causal relationships, and their imaginative activities that have educational implications.

Changes with Age in Social Orientation and in Understanding of Abstract Concepts in the Social Studies. As already noted above, the younger the child, the more preoccupied he is with his direct, personal concerns as distinguished from large social problems or long-term issues of cause and effect. The findings set forth in Table V illustrate this, and other lines of investigation emphasize the same point.

It is not until well along in the intermediate elementary grades, for example, that the average child, according to available evidence, can encompass in his plans or understanding the varied interests of a social unit as large as the enrollment of an average class, or identify himself effectively with so large a unit. Rather, during the early grades, the child's social orientation in his friendships, his loyalties, his role as a leader or follower, is restricted to smaller groupings within the class. Even in this limited sphere the team spirit is not likely to be strong. A child whose comprehension is thus limited within his own everyday social sphere is not likely to have the background of understanding or experience to comprehend the larger and more remote social issues involved in units on history, community organization, conservation, and other topics that frequently are stressed in the social studies in the early grades. It is possible, of course, that the development of a child's "social consciousness" might be accelerated by different educational practices than those that now prevail, but, as matters stand, it appears that in many

courses of study, under traditional as well as "progressive" auspices, children are being asked to deal with abstract social concepts that are beyond their ken and that are divorced from the realities of their own social behavior.

Children's understanding of abstract social concepts. As might be expected, children are likely to show gains from year to year in their grasp of the abstract terms and concepts that they meet in their studies or out-of-school contacts, but a good deal of haziness and many misconceptions concerning ideas that are freely used in textbooks and periodicals are likely to persist through high school and college years. In their grasp of social concepts to which they have been exposed in their reading and classwork, as in their grasp of items of information, children are likely to exhibit more or less understanding rather than complete knowledge or complete ignorance. Table VI, which is based upon studies by Pressey and Pressey, shows the percentage of children at various grade levels who answered correctly when tests were made of their ability to recognize the meanings of terms that are used in the study of American history. (Sample item: "What name was given to large areas before they became states? (a) Cities, (b) Factories, (c) Territories, (d) Jungles") It should be noted that the form of the test item will influence the correctness of a child's response: he may give the correct answer to an item such as the foregoing by rejecting alternatives that he knows are wrong even though he might not be able to define or use the term in question.

Another test procedure, among others, that has been used in this area is to ask the child to define a term in his own words, and then subsequently to evaluate his answer in terms of a rating scale. Table VII shows results obtained in a study by Meltzer in which children were asked to give the meanings of thirty different terms (such as democracy, socialism). Each answer was then evaluated on a scale from one to eight (the more adequate the answer, the higher its numerical rating).

TABLE VII

PERCENTAGE OF CHILDREN IN EACH GRADE
WHO CORRECTLY RECOGNIZED
THE MEANING OF VARIOUS TERMS *

| Term | Grade | | | | |
|------------------|-------|----|----|----|----|
| | 4 | 6 | 8 | 10 | 12 |
| Official | 28 | 59 | 78 | 91 | 94 |
| Representative | 26 | 53 | 62 | 76 | 82 |
| Secretary | 4 | 21 | 23 | 30 | 59 |
| Democracy | 28 | 50 | 80 | 84 | 95 |
| Government | 10 | 25 | 44 | 51 | 51 |
| Self-government | 37 | 42 | 76 | 76 | 85 |
| Territory | 37 | 88 | 96 | 97 | 98 |
| Charter | 21 | 58 | 60 | 65 | 77 |
| Petition | 21 | 33 | 55 | 74 | 89 |
| Tariff | 27 | 33 | 78 | 82 | 86 |
| Democrat | 33 | 51 | 87 | 91 | 92 |
| Progressive | 15 | 23 | 16 | 23 | 41 |
| Socialist | 11 | 25 | 42 | 50 | 75 |
| Republican | 33 | 51 | 87 | 91 | 92 |
| Radical | 9 | 20 | 31 | 52 | 78 |
| Conservative | 9 | 20 | 31 | 52 | 78 |
| Public utilities | 18 | 34 | 45 | 62 | 73 |
| Liberty | 84 | 89 | 99 | 99 | 99 |

Practical suggestions for the teaching of social studies. The difficulties involved in the teaching of concepts associated with the social studies are magnified by the limitations of knowledge possessed by high school pupils as well as by presumably well-educated adults.²³ What seems to happen, in both traditional

TABLE VIII

AVERAGE RATINGS OBTAINED AT DIFFERENT GRADE
LEVELS IN TESTS OF CHILDREN'S UNDERSTANDING
OF 31 POLITICAL, SOCIAL, AND ECONOMIC
CONCEPTS (MAXIMUM SCORE 248) †

| Grade | V | VI | VII | VIII | IX | X |
|-----------------|-------|-------|-------|-------|-------|-------|
| Number of Cases | 50 | 50 | 54 | 33 | 50 | 39 |
| Mean | 27 40 | 45 59 | 67 60 | 78 60 | 86 00 | 95 00 |
| P E. M. | 31 | 2 33 | 2 34 | 4 32 | 3 30 | 3 00 |

* From L. C. Pressey, "A Study in the Learning of the Fundamental Special Vocabulary of History from the Fourth through the Twelfth Grades"²¹

† From H. Meltzer, *Children's Social Concepts*.²²

and presumably progressive schools, is that children are exposed to a good deal of instruction in abstract terms which they do not understand and which are not presented in such a manner as to promote effective understanding

The main practical suggestion that emerges from the study of the development of children's concepts, as far as social issues are concerned, is that such concepts should be presented as realistically as possible from the point of view of the home-spun details of everyday life. The good or bad qualities denoted by many abstract terms such as justice, tolerance, monopoly, fair trade, democracy, unrestricted competition, and equality of opportunity can be translated into terms of concrete happenings in the classroom and in the everyday social behavior of children. Many economic concepts can similarly be rendered in terms of children's everyday experiences.

Concepts of Time. According to available evidence, it is not until after the age of nine or ten years that the average child has much understanding of time in the historical sense ²⁴ Knowledge of the sequence and duration of historical periods is likely to be quite spotty and limited well into the high school grades. Units of instruction in the early grades that dwell upon the memorization of the dates of historical events, or upon geological eras, are not likely to have much meaning. Similarly, in the early grades, units on the early American Indian or ancient Egypt will have a once-upon-a-time story-book flavor for children and are not likely to convey the ideas concerning chronology and continuity in human affairs that a teacher may intend. As such, a unit of this kind may still have a good deal of value, especially if it affords practice in concrete intellectual and manual skills and experience in cooperative effort.

An interesting indication of the manner in which a child's concepts of time and chronology seem to improve as a child's abilities mature and through the accumulation of everyday experiences associated with growing older (as distinct from special training during brief periods of instruction in the class-

room) is offered in a study by Pistor.²⁵ Two equivalent groups of sixth grade pupils were studied. At the beginning of the experiment, a battery of "Time-Concepts Tests" was administered to both groups. During the period while the children were in the sixth grade, one of the groups received instruction in history and chronology. The teachers made extensive use of time charts, time lines, and other devices for the teaching of time relationships and they also attempted to relate the work in history to current affairs. The other group received only incidental instruction in history as it related to the study of geography of Europe and Asia. At the beginning of the seventh grade, the tests of time concepts were again administered. During the intervening year, both the "history" and the "nonhistory" groups made gains on the tests, but the gains showed by the two groups were substantially the same and the average scores of the two groups were practically equal. Pistor points out that the evidence indicates that the factor of maturation, and the educative influences to which a child is exposed in the course of his everyday experiences, appear to be more influential at this age level than formal instruction concerning time or the use of time charts, time lines, and other devices. To the extent that this is true, "It is a waste of the child's time and of school time to attempt to teach historic periods and dates before pupils are ready to understand them."

General Information. The findings in studies dealing with children's information do not supply an inventory of standard items of knowledge which the average person at different age levels is likely to possess and which the teacher can count upon in planning a lesson unit or a course of study. To supply such an inventory would perhaps be impossible by reason of tremendous variations in the specific items of information possessed by children from varying backgrounds. Children in one community, for example, may be ignorant of bits of knowledge concerning biology, human institutions, everyday happenings, and topics of conversation that are

regarded as commonplace by children in another locality. In one study it was found, for example, that only about a fifth of city children in the age range from eight to twelve years had any notion that animals other than cows and goats have milk for their young. Groups of children showed wide differences in their knowledge concerning commonplace objects and commodities (such as, from what animal do we get beef? where does leather come from?), concerning sizes and distances and space in relation to time (such as the approximate distance a soldier can march in a day, whether a ton of coal would completely or almost or not nearly fill the space available in a large classroom), concerning directions (such as whether the sun rises in the north, south, east, or west).

It has been noted also in studies of information, as in studies of their understanding of words, that children may be able to repeat general items of information involving a given concept and yet be quite ignorant concerning the application of the same concept in another setting. Thus, children may report about the northward and southward flight of birds, and about the north and south poles, and yet be ignorant as to whether well-known points of local geography lie to the north or south. Such gaps are, of course, inevitable, are exhibited by adults as well as by children, and may make little difference as far as the child's progress in his studies is concerned. On occasion, however, lack of a given item of information may have a crucial bearing upon what children learn from a project and the correctness of their conclusions. Thus, in connection with a series of operations of a fifth grade class ²⁶ it was noted that the children failed to take account of the simple fact that cream rises to the top of a container of milk. They reached quite erroneous conclusions concerning the relative merits of two brands of milk when they performed a butterfat test, with the help of their teacher, and used top milk from one sample and not from the other. This rather homely little episode, incidentally, illustrates the way in which

erroneous attitudes and evaluations may be fostered when individuals lacking in details of practical knowledge or experience are precipitated into weighty social issues (in this case, the discussion dealt with the issue of private ownership of milk-distributing facilities).

In connection with a given course of study, it is possible to devise comprehensive information tests that can be helpful in showing the details that pupils know or do not know. In order to be most effective, such tests should be constructed in terms of the objectives and the specific content of a given unit of instruction. Such is the specificity of children's information on some topics, however, that even such a test may fail to reveal a pupil's difficulties, for he may be able to answer a given question in terms of what he has read or heard and yet a different phrasing of the question might reveal that he has not fully grasped the item of information that it involves. For this reason, the insights that an able teacher can obtain through a variety of informal, person-to-person contacts with individual pupils are likely to reveal more concerning their information, and the ways in which they best can be helped to learn than will be revealed by the results of a formal test

Relationship between Information and Attitudes. In many areas, a practical distinction can be made between a person's academic knowledge about a matter and his attitude toward it. A person who knows relatively little about a subject may express strong prejudices with respect to it, while another person who is better informed may be quite dispassionate. Likewise, two persons who have the same store of general information may differ in the stand they take by virtue of a concrete experience, of a pleasant or an unpleasant sort, that once befell one of them. Indeed, as indicated in an earlier chapter, an individual's evaluation at any given time may be influenced directly or indirectly by earlier experiences that he cannot recall. Many of the likes and dislikes, expressions of partisanship, prejudice, or enthusiasm that an individual exhibits in everyday life trace to earlier direct expe-

riences that had an emotional tinge. However it is also true that attitudes frequently do not arise through first-hand experience but through secondary means, such as conversation, pictures, reading materials that have a favorable or unfavorable tone. Moreover, the smaller the amount of information or understanding a person has with respect to a given issue, the more credulous he is likely to be and therefore the more susceptible to such influences. Once a person has taken a stand he may persist in it quite tenaciously in spite of subsequent contradictory evidence. This is especially likely to be true if his own desires or self-interest are involved. In matters involving his own prestige he may not only reject information that is unfavorable but he may also seek information to confirm his bias. Similarly, he is more likely to learn and use information or viewpoints that he desires to be true than to make a disinterested search for the facts.

In studies of adults as well as of children it has been found that in connection with many topics there is little correlation between the intensity of partisanship or feeling and the amount of information possessed. In an investigation of children's information and attitudes concerning the wars that prevailed at a given time in 1940 (Japanese *vs.* Chinese; Russians *vs.* Finns; The Axis Powers *vs.* the Allies) it was found, for example, that there was little change with age in expressions of attitudes toward the belligerents even though there was a substantial increase with age in the amount of knowledge the children had concerning the war alignment of belligerents, personalities, implements, forms of strategy, geographical features, etc. There was a very low relationship (a correlation of .14) between quantitative scores in tests designed to measure firmness of opinion or degree of partisanship and tests of amount of information.²⁷

This does not mean, of course, that attitudes invariably remain fixed. Numerous studies, mainly centering on high school and college students²⁸ indicate that shifts in attitude may be obtained by means of lectures, reading materials, etc.,

and that notable changes may occur over a longer period of time, such as the interval between the freshman and the senior year in college. However, changes can more readily be induced in attitudes relating to issues or policies that are academic or relatively remote from an individual's day-to-day concerns than in attitudes that are deeply rooted in early childhood experiences or bear upon an individual's self-interest or desires in his everyday life.

The fact that children may entertain definitely favorable or unfavorable attitudes with respect to many subjects while yet they possess only a meager amount of information has many practical ramifications. It enables parents to impose many of their own prejudices upon their children. It helps to account for much of the irrational behavior shown by adults. It helps to promote the large volume of indoctrination that goes on in school (even under the instruction of a teacher who tries to help children to arrive at their own conclusions). It places a strong weapon in the hands of interested persons or groups who wish to control the ideas and actions of others through steeping them, at an early age, in the lore and prejudices of a given form of social life, ranging from the customs of a primitive tribe to the ideologies of present-day political groups. It also accounts, in part, for the lag between advancements in science and the application of scientific findings to practical affairs.

DAYDREAMS AND DREAMS

Functions of Daydreams and Make-Believe. Children begin to dream and to engage in make-believe in infancy, and most persons continue these enterprises throughout life. Make-believe and daydreaming serve an important function in the child's development. Make-believe serves as a means of organizing much of the young child's play activity and thus, among other things, provides a setting for the exercise of motor skills. It functions as a vehicle for social contacts and as a means of organizing group projects. Through it the child

is able to transcend time and space and his limited powers and thus give play to ideas and activities that otherwise would be dormant. In time, make-believe may represent a retreat from reality, but in early childhood, and to a lesser extent in later years, it serves as a way-station to reality and is likely to be linked to the everyday activities and problems.

Content of Make-Believe. The imaginary activities of normal preschool children deal to a large extent with domestic themes or patterns of activity that they have experienced or observed in their everyday lives, such as housekeeping, preparing and eating foods, caring for animals, going on trips by automobile, train, or boat.²⁹ In connection with their make-believe, the children reflect many of their wishes. The child who actually is allowed less cake than he would like may provide an unlimited supply of make-believe cake. Children who are burdened with emotional problems will also occasionally reflect these in their make-believe play or spoken phantasies, as when a child who is jealous of a younger sibling devises a make-believe situation in which the little child is naughty and is punished, or is left alone at home when the rest of the family goes on a trip.

Make-believe themes continue in the play of children in the early elementary school years, but during the late preschool years and thereafter less and less of the child's imagining is revealed by his overt activity or his language. As the child's imagining becomes more private it also tends to deal less with everyday events and it includes more adventurous or dramatic themes in which the child plays a heroic role. Many of these vicarious experiences that a child undergoes are remote from everyday life as far as the actual happenings are concerned, but their emotional content is influenced by the child's everyday desires and frustrations.

Factors Causing a Diminution in Make-Believe in Later Years. Although daydreaming continues into adult years, a child is likely as he grows older to lose some of the capacity for abandoned phantasy that prevailed at an earlier age.

With an increase in his abilities, there is less need for supplementing his powers in a vicarious manner, and the enlarged range of his everyday activities encroaches upon the time available for daydreaming. As he gains in knowledge and experience, he also becomes more aware of inconsistencies and he finds it difficult to lose himself in impossible make-believe situations. Sometimes an older child will bring his knowledge to bear in such a manner that a daydream becomes so arduous that it is abandoned, as when he starts blithely as a daring aviator and then becomes engrossed with the problem of making proper provision for landing fields, fuel, special equipment, and other spare parts. Older children vary, however, in their tendency to abandon themselves in phantasies, as do adults. For one individual, daydreaming may serve only as a momentary form of relaxation, while for others it may serve as a refuge, or as a substitute for action, as a chronic form of giving play to resentments, gratifying wishes and ambitions, or of devising excuses for failure actually to achieve. The daydreams of the same individuals at different times may range from a flow of imagery that approximates organized planning and thinking to snatches of unrealistic phantasy.

Ramifications of Children's Make-Believe. The capacity for make-believe has wide ramifications in the everyday interests and pursuits both of children and adults. When children, for example, read adventure stories, or give eager attention to radio serials and motion pictures, they are indulging in a form of make-believe. Frequently a child or adult who is quite realistic and businesslike in his everyday enterprises will be devoted to serials that involve impossible or absurd situations and spurious character portrayal, just as in his own daydreams he may venture into impossible situations and perform impossible feats.

Such tastes in drama and fiction by way of reading materials, radio programs, and the movies frequently are looked upon with intolerance and disdain by adults whose own make-

believe tastes are somewhat more sophisticated. This difference in taste sometimes leads to friction between adults and between parents and their children. Much friction of this sort could be avoided if such adults had more respect for characteristics that are a normal feature of the development of children, and more regard for individual differences among their fellow-adults.

There are, of course, numerous other practical issues involved in the management of children's reading, radio, and movie interests. These include the matter of the amount of time that profitably may be spent on such pastimes, possible ill effects from emotionally exciting stories and dramatizations, interference with homework and other duties, and concern for the convenience and comfort of other members of the household. Moreover, it also may be noted that it is not necessary to resort to crude, melodramatic absurdities to satisfy a child's interest in vicarious experience.

Make-believe and realism in children's pastimes. As indicated above, children's reading, movie, and radio interests parallel their make-believe interests in many ways, but just as the child carries on many realistic* projects apart from his make-believe in his everyday life so he also seeks solid fare in his reading and, usually to a lesser extent, in connection with movies and radio programs. In his reading, for example, the child shows much interest in adventure, but in the intermediate elementary grades and beyond many children dip extensively into factual and informative materials, such as writings on travel, nature lore, history, and biography, how to do and how to make things. Such interests may be permanent if associated with practical interests or hobbies, such as photography or mechanics. When reading materials thus tie in with a concrete, practical concern, a child may master rather difficult details concerning chemistry, electricity, nature

* It may be pointed out that a factual account dealing with "real" events may be quite "unreal" from the child's point of view if it deals with matters that are remote from his own concerns and everyday knowledge.

study, and the like that would not appeal to him in the abstract. Moreover, when children do seek information, as in voluntary readings in the field of science, most of them like to have it in interesting form, to be sure, but many of them also like to have it "straight," without needless embroideries (such as personification in the study of animals). This point is emphasized in a study of children's choices in science books, in which it also was found that children would select books over a wide range of "reading difficulty" in seeking information on a topic in which they were interested.³⁰

Children's interests in radio programs. In their choices of radio programs children give a high vote to adventure serials, as indicated in Table IX. Large numbers also seek other types of offerings, however, such as concerts, news broadcasts, hobby and "quiz" programs, and dramatizations of historical events. Some of these types of programs gain in appeal as children pass from the upper elementary into the junior high school period. The extent of their appeal is not adequately shown in a summary such as that presented in Table IX, which lists only the twenty programs that had the highest rank in the study in question. While some programs increase in popularity as children grow older, others show a decline. Programs based upon frankly make-believe themes (such as dramatizations of fairy tales) have more appeal in the age range from about five to eight years than thereafter. Programs of a "folksey" sort (reminding children of their birthdays, and including "chit-chat, story, and song" for young folk) likewise lose in favor in the age range from five to twelve. One such program, noted in Table IX, ranked fourth from the top in popularity at six to eight years, and fell to a rank of twenty-five from the top at ten to twelve years. Certain programs of a distinctly juvenile sort, involving melodramatic adventures revolving around juvenile characters, retain a high degree of popularity throughout the range from six to twelve years, but show a decline in popularity thereafter. It may be noted, in passing, that surveys of children's radio

TABLE IX

The twenty radio programs reported as "listened to" most frequently by children in the Metropolitan New York area in 1936 and 1937, including comparisons between boys and girls and between children aged 6-8 and 10-12 years. The values show the rank of each program in frequency of mention as compared with all other programs that were named (A value of 1 means that the program ranked first or was mentioned more frequently than any other, a rank of 6½ means that the program in question was tied for sixth place with another program.) Programs designed primarily for children (juvenile) and for adults are so labeled. Adapted from A. T. Jersild, *Children's Interests in Radio Programs*. Reproduced by permission.³¹

| | <i>All Boys and Girls 6-14 yrs</i> | 6-8 | 10-12 | <i>All Boys</i> | <i>All Girls</i> |
|--|--|-----|-------|---------------------|----------------------|
| <i>Number of Children</i> | 1344 | 355 | 649 | 726 | 618 |
| <i>Program identification, Fall 1936</i> | | | | | |
| Adventures of a boy and company, cowboy setting, but varied locale, considerable humor and horse-play (juvenile) | 1 | 3 | 1 | 2 | 1 |
| Interplanetary adventures in a future setting, rocket ships, etc (juvenile) | 2 | 2 | 2 | 1 | 3 |
| Comic-strip detective hero (juvenile) | 3 | 1 | 3 | 3 | 2 |
| "Western" drama of an earlier generation (juvenile) | 4 | 9 | 4 | 4 | 6½ |
| Adult comedian, songs, jokes, variety (adult) | 5 | 7½ | 5 | 5½ | 4½ |
| Melodramatic adventures of a high school boy and company (juvenile) | 6 | 7½ | 6 | 5½ | 8½ |
| Adult comedian, relatively subtle humor, variety (adult) | 7 | 16 | 10 | 7 | 6½ |
| Melodramatic adventures of a girl and company (juvenile) | 8 | 5 | 8 | 13 | 4½ |
| Mystery and crime (adult) | 9 | 14 | 7 | 10 | 8½ |
| Comic-opera strong-man, with music, phantasy in contemporary setting (juvenile and adult) | 10 | 6 | 11 | 10 | 11 |
| Homely drama of two black-face characters (adult) | 11 | 11 | 12 | 12 | 11 |
| Melodramatic adventure and crook-thwarting by a juvenile character and company (juvenile) | 12 | 18 | 9 | 10 | 15 |

TABLE IX (Continued)

| | <i>All Boys and Girls 6-14 yrs</i> | <i>6-8</i> | <i>10-12</i> | <i>All Boys</i> | <i>All Girls</i> |
|---|--|------------|--------------|---------------------|----------------------|
| <i>Number of Children</i> | <i>1344</i> | <i>335</i> | <i>649</i> | <i>726</i> | <i>618</i> |
| <i>Fall 1936 (continued)</i> | | | | | |
| Adult male and female comedy team (adult) | 13 | 12 | 13 | 15 | 11 |
| Adventures of a boy and company in prehistoric times (juvenile) | 14 | 17 | 14 | 8 | 28 |
| Drama of two women characters and company (adult) | 15 | 13 | 16 | 19 | 13 |
| Amateur hour (adult) | 16 | 23½ | 17 | 16 | 16 |
| Crime and crime detection (adult) | 17 | 32 | 15 | 14 | 21½ |
| Chit-chat, story and song for young folk (juvenile) | 18 | 4 | 25 | 17 | 17 |
| Everyday and unusual adventures of two everyday children and company (juvenile) | 19 | 19 | 18 | 19 | 18½ |
| Amateur hour of juvenile performers (juvenile) | 20 | 15 | 19 | 29 | 14 |
| <i>Other programs among top 20, Spring 1936</i> | | | | | |
| Adventure involving mystery, magic, and villainy (juvenile) | 6 | — | — | 6 | 6 |
| Adventures of two boys and company (juvenile) | 7 | — | — | 8 | 9 |
| Comedian and cast (adult) | 11 | — | — | 9 | 12 |
| Weekly dramatized stage or screen play (adult) | 15 | — | — | 23 | 11 |
| Canadian Mounted Police adventures (juvenile) | 18 | — | — | 10 | 29 |
| Dramatizations (adult) | 19 | — | — | 13 | 22 |
| <i>Other programs among top 20, Fall 1937</i> | | | | | |
| Adult funny-man (juvenile and adult) | 9 | — | — | 13 | 11 |
| Cowboy and Western serial (juvenile) | 13 | — | — | 8½ | 18½ |
| Crime and detective (juvenile) | 15 | — | — | 11 | 17 |
| News dramatization (juvenile) | 18 | — | — | 14 | 25½ |

and movie interests show that the most popular productions are likely to include many that are primarily directed at adults as distinguished from "juvenile" features.

The extent to which children are attracted to vicarious experiences by way of reading, radio programs, and motion pictures is indicated by the amount of time devoted to these pastimes. In several communities that have been studied it has been found that the average child of elementary school age spends about two hours a day at the radio during the late fall and winter months (there is a marked reduction, usually, with the coming of spring and summer and longer hours of daylight for outdoor play) The amount of time varies, of course, with different children, and it may also be noted that children frequently combine radio listening with another activity A large percentage of urban children likewise go to the movies at least once a week. Additional time is spent in reading comic books and comic strips (which in many communities constitute a large proportion of the reading that is done), but the exact amount of time thus consumed is rather difficult to estimate. Data are not available for providing an accurate measure of the total amount of time devoted to these three types of entertainment. However, in the case of city-dwelling children of middle or below-average socio-economic status, it can roughly be estimated from the available information that the average child during the span of years from seven to fourteen devotes about the equivalent of one year of his waking hours to these pastimes

Dreams. The content of dreams includes material from experiences of the day, but the elements and the associated images may be drawn from such diverse contexts that it is difficult to recognize their origin In the dream, to a greater extent than in the daydream, the happenings are vivid and seem real; they are likely to lack apparent consistency and to present impossible combinations of events Although dreams may be bizarre and seem quite meaningless, they do not "just happen." Their contents have roots in everyday expe-

riences, and their emotional tone is influenced by the desires and fears of waking life. A recurrent terror dream, for example, although it may occur in many forms and involve situations that present no direct menace during the day, bespeaks the presence of unresolved anxieties, just as pleasant dreams may bring gratification of wishes that a person entertains more or less candidly during his waking hours. In children as in adults dreams sometimes have an incidental disciplinary value and serve to strengthen resolutions of the day, as when a child who is chronically tardy dreams that it has become dark during his return from an errand and that the door of the house is locked, or a professor dreams that he is late for class and all the students have gone.

Pleasant as well as unpleasant dreams are common in the lives of most children and adults. A large proportion of young children will experience terror dreams on occasion, and frequently a child will pass through a period when such dreams frequently recur. As indicated by the findings in one study ³² there is a decline with age from the preschool period onward in the frequency of vivid terror dreams, but such dreams recur at any time of life.

Unpleasant dreams are likely to be more frequent during times of stress and they may be precipitated by temporary disturbances such as illness, extreme fatigue, and unusual excitements that have occurred during the preceding day. The fears reflected in the dream are more likely to resemble imaginary fears that are entertained during waking moments (such as fear of wild animals, falling from extreme heights, being attacked by bad people) than the dangers that actually threaten during the day. A notable exception to this occurs sometimes in the case of recurrent dreams following an actual harrowing experience, such as being involved in a traffic accident.

MORAL CONCEPTS

The child's first ideas of right and wrong are determined largely by the verdict of his parents concerning specific acts

that are forbidden or praiseworthy. Throughout life an individual's moral code continues to be determined to a large extent by authoritarian rules in the form of conventional standards, and, directly or indirectly, the teachings of religion. The fact that there are ready-made "authoritarian" conventions and moral demands is, of course, fortunate, for there would be moral chaos if each individual, in every act of his life, were to depend solely upon precepts that he has reasoned out for himself.

Even from a rather early age, however, the child is able to formulate some moral principles in terms of the reasons that lie behind them and to adopt them as his own rules rather than simply as edicts that have to be obeyed because others have so told him. This is illustrated by the findings in one study in which children were asked what they thought about cheating in their school work ³³ In the case of children from relatively superior home backgrounds, a large proportion of answers from the age of seven and onward were to the effect that it does not pay to cheat, for one cannot learn that way, or to the effect that cheating is unfair to the other person. Answers such as these go a step beyond authoritarian answers to the effect that cheating is bad because it is forbidden by the teacher, although, of course, in individual cases an answer to the effect that cheating is unfair may be a verbal pattern that is equivalent to the answer that cheating is bad. In the case of individuals from poorer backgrounds, children at the earlier age levels offered a larger proportion of "authoritarian" answers (it is bad, it is naughty). At still earlier levels children have many opportunities to learn the meaning of rules of conduct through the natural consequences of their acts, as when they learn to curb their impulse to hit another child or to snatch his possessions in order to avoid retaliation or the discomfiture of seeing another cry. Needless to say, learning of this sort is never thoroughgoing.

In childhood as in later years, a person's ideas as to what constitutes proper conduct are likely to show many irregu-

larities and inconsistencies. He may have rigid principles concerning the wrongfulness of cheating, stealing, and mayhem under some circumstances and yet condone such acts in other circumstances in which his principles should apply with equal force. The consistency with which he exercises his moral code will depend in part upon specific learning, in part upon the likelihood of direct retaliation, in part upon the remoteness of the issue from his own daily life, and, in large part, upon his desires and prejudices. Children learn at a relatively early age, through the example of their elders, to take many such inconsistencies and evidences of insincerity for granted, and to rationalize the inconsistencies in their own practices when they are called to account.

SUMMARY

In the foregoing we have noted many of the changes that take place in the intellectual life of the child as he develops from infancy to maturer years. At birth the child's higher brain centers are as yet not fully developed. He is responsive to some forms of sensory stimulation but he does not have the sensory acuity that he will acquire in time. His "mental world" at the start seems to consist primarily of experiences arising through direct physical contacts with the environment and through the sensations that arise within his own body. With the passage of time impressions received through the "distance receptors" — the eyes and the ears — gain increasing prominence. Through the accumulation of experiences from day to day more and more events take on meaning. He becomes able to differentiate between phenomena that earlier were not distinguished from one another. There is an increase in his capacity to respond to symbols or "reduced cues."

Most of the experiences that befall the child during the early years of life while his mental capacities are rapidly developing are lost in oblivion. A majority of persons are unable to recall with any degree of accuracy events that befell them

before the age of about three, and even then their recollections are scanty compared with the sum total of their experience.

In the process of growth the child's mental world expands in many dimensions. As he moves from the cradle to the larger world his mental horizons widen. At an early age, likewise, his experiences gain in depth, so to speak, as the present event is interpreted or reacted to in the light of past associations. With the development of the imaginative abilities and the ability to plan, the dimensions of the child's mental world are extended into anticipation of the future.

Beginning perhaps as early as the first year of life, children exhibit the ability to imagine and to engage in make-believe. Such make-believe activities, although they may eventually function as a form of escape and operate as symptoms of emotional maladjustment, serve as an instrumentality in the child's exploration of the world and in his efforts to organize his experiences and to solve his problems. Through the use of make-believe he is able to enter vicariously into a wider range of experience and to transcend, in part, his own limitations. Related to his own private daydreams is his interest in vicarious experiences that are provided for him by way of his reading, and by way of radio programs and motion pictures.

With advancing age there tends to be an increase in the child's ability to concentrate over longer periods of time. The ability to give sustained attention varies with the nature of the task. The child's span of attention is likely to be longest in the case of activities that he himself has chosen or that are undertaken in connection with his own designs. In general, here is an increase with age in the child's ability to give sustained attention to an assigned task.

The development of children's ability to reason is gradual and continuous rather than characterized by distinct stages. However, there are changes with age in the range and complexity of problems which engage the attention of children and to which they will apply themselves. The younger the

child, the more do his everyday thoughts tend to be concerned with events related to his own immediate experience and well-being; as he grows older, he becomes increasingly able to occupy himself with more remote issues and to deal with abstractions as distinguished from concrete experiences. Such changes can be noted in connection with the enlargement of the meanings associated with various terms in the language that he uses, in the interest and ability he eventually displays in dealing with social issues, and in his ability to take cognizance of events in the larger world, in terms of both present happenings and the historical past.

In the development of information and concepts it is likely that a child's knowledge or grasp will vary considerably in the case of different topics or areas of experience. Depending upon his past opportunities for learning he may be well informed and be able to reason effectively in connection with one topic and not in connection with another. Accordingly, he may seem very naive and illogical in dealing with one problem and quite logical in dealing with another. It also is true that when adults face a problem that is new or quite unfamiliar they will make errors and give inconsistent or illogical answers similar to those that may be offered by a child. However, changes that normally come with added maturity cannot be brought about simply by giving the child concentrated experiences or special training over a short period of time. Many of the gains that are shown, such as in speed of perceptual response, the ability to grasp concepts relating to matters remote from the child's own immediate experience (such as the concept of historical time), and the ability to learn and to master subject matter (such as long division in arithmetic) do not result from coaching alone. Concentrated periods of practice or instruction at a given stage of growth cannot bring about the changes that take place over a period of years through the joint influence of growth and such indirect instruction as everyday experience affords.

Studies of children in the elementary and high school grades indicate that pupils frequently are called upon to deal with abstract and complex problems, especially in the field of the social sciences, before they have the background of experience adequately to grasp the subject matter. When such is the case, much of what a child learns is primarily of a verbal nature, divorced from realities or practical applications to the decisions that are made in everyday life.

As children grow older, there are changes not only in their information about affairs in the world at large but also in their attitudes toward such affairs. Frequently there is little relationship, however, between a child's attitude (the stand which he takes for or against, the liking or disliking, prejudice or tolerance which he exhibits) and the amount of knowledge he possesses concerning a matter at issue.

QUESTIONS AND EXERCISES

1. Make a list of your own "early memories." At approximately what age did the first experience which you can recall occur? How do you account for the fact that you happen to remember the particular items on your list while other experiences at the same period of life have been forgotten?
2. What are some steps that a teacher might take roughly to determine the optimum length of class periods?
3. Can you think of any words, terms, or concepts which have entirely different meanings to you now than was the case when you first encountered them in your lessons, in your schoolwork, or in your everyday experience?
4. It has been found that children at the elementary and high school levels are frequently exposed to instruction in abstract terms which they do not understand and which are not presented in such a manner as to promote effective understanding. What steps might be taken to remedy this?
5. What are some concrete ways in which terms or concepts involved in the social studies might be made more meaningful to pupils at various grade levels?
6. What practical implications with respect to the value that pupils may gain from free discussion in classrooms at various grade levels emerge from the findings set forth in Table VI?

7. Point out what is wrong about the following proposition: It is a good policy, in teaching nature studies or natural science at the primary school level, to use the technique of personifying animals and natural events (the "Peter Rabbit" approach) since the thinking processes of young children differ from those of older persons
8. What are your reactions to the study of the development of children's time concepts as briefly described on p 200 and following? Do the findings seem reasonable in the light of your own experience or your observation of others?
9. From the point of view of practical implications, do findings such as those offered in the study referred to above mean that the subject matter in question should be postponed until a later time? Or that better ways of teaching should be devised for helping children to master the subject at an earlier age? Or that the basis of selection of what is included in the curriculum should be changed?
10. What, in your judgment, are some of the reasons that account for the fact that there frequently is little relationship between the amount a person knows about an issue or condition and the degree of prejudice or partisanship he may exhibit with respect to the issue or conditions?
11. Think of changes that have occurred in your own stand or attitudes (with respect, say, to political or national policies, other nations or nationalities, the rightness or wrongness of certain acts or habits, etc.). What caused you to change your stand? To what extent did added information or experience induce the change? To what extent were you influenced by wishes or desires, or by fears and resentments as distinguished from a rational analysis of the facts in the case?
12. Under what circumstances will added knowledge or experience be most likely (and least likely) to induce a change in attitude?
13. Describe ways in which make-believe and daydreaming may serve a useful purpose
14. What, in your opinion, are some of the bad qualities of children's radio programs that you have heard? What values do children receive from radio dramatizations? Make a list of standards or criteria that should be taken into account to provide what you would consider to be a good radio program for children.
15. What is your opinion of the value of the "comic" magazines or booklets that children read so avidly? Do you think they are harmful? In what ways might some of the features that make the comics so attractive to children be adapted for use in school?

- 16 Do you think that the vicarious experiences which children derive from radio programs, comic books, and the movies are, in general, more harmful than wholesome? Give reasons pro and con If you had complete control of these media of entertainment, would you insist that they be changed, or would you allow them to continue as they are? Give reasons for your answer
- 17 What are some of the practical difficulties that are encountered in the moral training of children? What are some of the moral principles that are most likely to be taught by precept rather than by example?

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CHAPTER VII

The Nature and Measurement of Intelligence

The preceding chapters have shown that children *grow* in various mental abilities and efficiency. Illustrations were given of the forms which development takes in a number of particular types of mental activity. This chapter will be primarily concerned with one of the most significant fields of work in psychology, namely, the endeavor to analyze and define intellectual activity. Underlying this work have been several purposes. One was to determine whether intellectual abilities in various lines are largely independent of each other or closely related. Stated in a different way, the question was: Is there such a thing as general intelligence or are there only many unrelated special mental capacities? A second major problem was to develop devices for measuring accurately either general intelligence or special mental abilities or both. It was apparent that the development of a test or measure of ability or abilities would make it possible to ascertain many types of information about mental achievement, such as the rate of mental growth, differences among individuals in intellectual power, the effects of parentage (heredity), home conditions, schooling, and other factors. It would, in fact, make possible a *science* and a *profession* of mental measurement.

TYPICAL TESTS OF INTELLIGENCE

Early Conceptions of Intelligence. The fact that individuals differ in ability to learn, to adjust to novel situations, and to manage things, people, and ideas, has been repeatedly observed throughout the course of recorded history. In the

early stages of experimental psychology, efforts were made to measure more precisely some of the aspects of intelligence. In 1880, Ebbinghaus first succeeded in devising tests of ability to memorize various materials with sufficient accuracy to portray individual variations. Following this notable accomplishment, many types of single tests, such as the completion of sentences in which certain words were omitted, the completion of pictures, the speed of recognizing figures, words, or sentences, the cancellation of letters from specified materials, arithmetical operations, association tests, etc., were suggested as possible touchstones of general intelligence. The search for a single test, guided by the belief that intelligence was a single unitary power that might disclose itself in clean-cut fashion in a single task or situation, inevitably led to but partial success.

Binet's Conception. It remained for Alfred Binet, a distinguished French psychologist, to conceive the idea that intelligence was not a single narrow quality or power, but a complex organization of abilities. The effect of this belief was a change in the method of approach to the problem. Conceiving intelligence to be not homogeneous but possessing many aspects, Binet began a search for many types of performances or problems in which intelligent behavior should be displayed. Believing also that intelligence was largely native, although recognizing the fact that previous experience influences the results of most psychological tests, Binet began by searching for bits of information available to children in all walks of life, and for problems, puzzles, questions, mental tasks of various types that were not likely to be encountered under ordinary home or school conditions. The information sought, then, was of the sort that every child has ample opportunity to acquire, and the problems of a type that no child was likely to have previously learned to solve.

The Binet-Simon Tests. After fifteen years of work, in part of which he was assisted by Theodore Simon, Binet published in 1908 the series of tests known as the Binet-Simon Scale of Intelligence. Stimulated by this successful achievement, a

large number of extensions and revisions of the scale have been made in many countries. In America the work has been specially active, and, among the several revisions, that by Terman known as the Stanford Revision and Extension of the Binet-Simon Scale has been used most extensively since the time of its publication in 1916. In 1937, Terman, with the help of Maude A. Merrill, published a Revised Stanford-Binet Scale similar to the first revision, but embodying improvements in detail. There are two forms of the Revised Stanford-Binet. Each contains 122 subtests and seven alternate tests, one at each of the levels below six years, and covers a wide age range — from two to fourteen years, followed by four “adult levels”

What this scale measures may be discussed more readily after examining some of the 129 tests of which it is composed. In Form *L* in the group for age two are the following tasks:

- 1 Placing blocks in a three-hole form-board
- 2 Identifying by *name* four of the six following objects kitty, button, thimble, cap, engine, spoon
- 3 Identifying three of the following four parts of a doll. hair, mouth, ear, hand.
4. Building a tower with four or more blocks patterned on one built by the examiner
- 5 Naming two of a series of eighteen pictured objects such as chair, bed, shoe, clock, scissors, gun, house, etc
6. Using together spontaneously two words such as “all gone,” “baby hungry,” etc
7. Obeying simple commands, such as “give me the kitty,” “put the spoon in the cup” (an alternate test)

For year ten, the following tests appear:

- 1 Define at least eleven words in a list of forty-five ranging from easy to hard. Words at about the ten-year level of difficulty are: muzzle, haste, lecture, Mars.
2. Pointing out the “absurdity” in a picture, such as that of two Indians attacking a pioneer who is aiming his gun at a third who is also in sight but who is much farther away
3. Reading a paragraph aloud in thirty-five seconds with not more than two errors and then recalling at least ten of twenty-four facts or ideas in the passage.

4 Giving "reasons" for example, giving two reasons why children should not be too noisy in school and two reasons why most people would rather have an automobile than a bicycle

5. Naming (saying spontaneously) at least twenty-eight words (any words at all) in one minute

6. Repeating six digits such as 4, 7, 3, 8, 5, 9

Other Revisions of the Binet Scale. Several other revisions of the Binet Scale have been made. One, known as the Kuhlmann Revision, has been widely used, especially for very young children. Originally published in 1912, it was revised in 1922 and again in 1939.

The 1939 revision is known as Kuhlmann's Tests of Mental Development. It contains eighty-nine tests and nineteen supplementary tests. The tests range from sitting with support, which fifty per cent of four-month-old children are able to pass, to drawing upright forms as they would be seen in inverted positions, which is passed by fifty per cent of children twelve years six months old. The scale gives mental ages from four months to sixteen years.

The various Binet Scales are instruments of precision, carefully standardized, which must be given to subjects individually and which are reliable only when administered by trained examiners. Most experts on the Binet Scales believe that a reliable examiner must have, in addition to considerable general tact and skill in handling individual children, much special insight and skill which comes only from extended training and experience in using each form of the Scale.

Other Individual Tests of Intelligence. In addition to the several Binet types of scales, there are nearly a score of other individual tests, that is, tests which must be administered to one subject at a time. For example, The Merrill-Palmer Scale consisting of thirty-eight tests was especially designed for preschool age — from eighteen months to about five and one-half years. Recently the Minnesota Preschool Scale has been developed in two equivalent forms for use with children from about eighteen months to five years of age. A special

nature of this scale is that a child may earn a mental rating based either on verbal tasks, nonverbal tasks, or a combination of verbal plus nonverbal items. This permits it to be used readily even when the child has a manual or a language disability. These are two examples of the many individual tests now available for special groups.

Performance Tests. There are many tests of the performance type, that is, tests which employ tracing a maze, fitting forms into a "form-board," or similar activities rather than verbal problems and answers. The Pintner-Paterson Scale of Performance Tests was the first of the type to be developed. There are fifteen form-board tests in this scale which may be used for children from four to sixteen years. The Arthur Point Scale of Performance Tests, suitable for approximately the same age range, consists of form-boards, picture completion, block design, and other assembly tests. The Porteus Maze Test consists of a series of pencil mazes beginning with one suitable in difficulty for the average three-year-old child and culminating with one that requires average adult ability.

The performance tests are used chiefly not as a substitute for the Binet Scales but as supplements except in cases where a language difficulty, deafness, or other handicap makes the use of the Binet impossible or uncertain. Most of the performance tests, however, follow Binet in arranging a variety of problems in a range of difficulty from easy to difficult. Performance tests, especially such types as the Porteus Maze Test, measure appreciably different abilities, usually more specialized types of ability than the Stanford-Binet.

Group Tests. The tests mentioned above are all "individual tests." To provide measures of intelligence with which a large number of persons may be tested at once, at less cost and with less expert examiners, a variety of "group" tests have been developed.

Group tests may be divided roughly into two types, the *verbal* and the *nonverbal*, although many include both types of material. Of the verbal tests, the most familiar is the "Army

Alpha," devised by a group of American psychologists and applied, beginning in 1917, to more than a million and a half men in the American Army during the First World War.

The Army Alpha test, given to recruits who could read and write, consists of 212 separate questions, exercises, or problems of eight general types, of which four are here illustrated.

The first group of tests comprised twelve tasks ranging from easy to hard, of the following type.

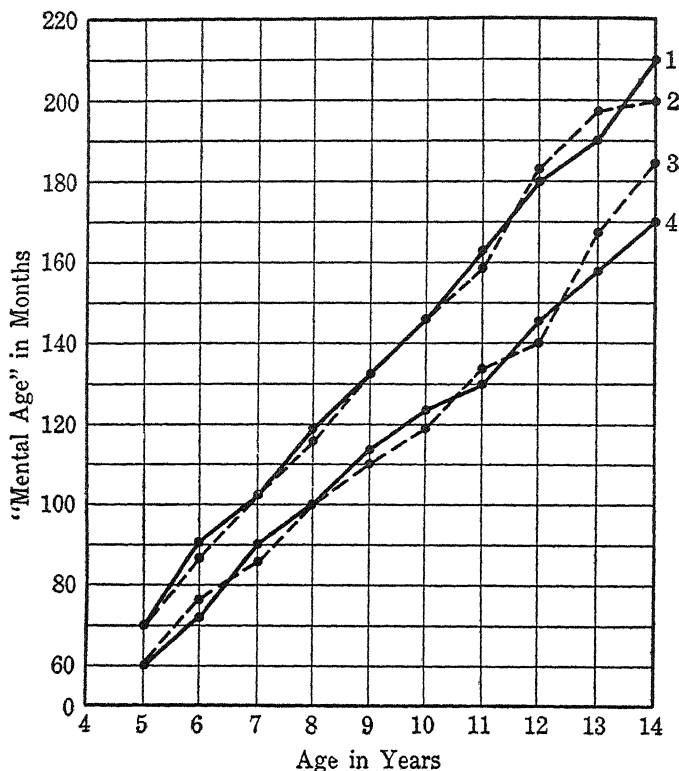


FIG. 9. ACTUAL MENTAL GROWTH CURVES FOR FOUR GROUPS OF CHILDREN OBTAINED BY CONSECUTIVE ANNUAL MEASUREMENTS WITH THE STANFORD-BINET SCALE

Number 1 is a curve for bright boys, 2 for bright girls, 3 for less bright girls; and 4 for less bright boys. If the lines were straight, a constant I Q. would be indicated (From Baldwin and Stecher, Univ. of Iowa Studies, 1922, II, No. 1.)

The examiner says: "Attention. Look at the square and triangle at 3. When I say 'go,' make a cross in the space which is in the triangle but not in the square, and also make a figure 1 in the space which is in the triangle and in the square. — 'Go!' " (Allow not over ten seconds)

Test two consists of twenty arithmetic problems.

Test three consists of sixteen "common-sense" problems. The subject is to make the best answer. The easiest and most difficult are. (1) Cats are useful animals because — they catch mice, they are gentle; they are afraid of dogs. (16) Why is it colder nearer the poles than at the equator? Because — the poles are always farther from the sun; the sunshine falls obliquely at the poles; there is more ice at the poles.

Test four consists of forty pairs of words, the two words of each pair being either synonyms or antonyms. The examinee is to underline *same* or *opposite* where appropriate. The first and last pairs are:

wet — dry
encomium — eulogy

same — opposite
same — opposite

There are many other verbal group tests, some especially designed for elementary schools, some for high schools, some for colleges, and others for use among clerical and other occupational groups. Nonverbal group examinations have been devised to test very young children, illiterates, and others who cannot read or write words. In some of these examinations directions are conveyed orally, in others by means of pantomime. Recently group tests have been developed for preschool children, kindergarten children, deaf, visually handicapped, and other special groups.

There are now in use a very large number of intelligence tests, but they do not all measure exactly the same ability or abilities. They have much in common but are not identical, either in content or purpose. Some of them represent endeavors to provide tests for a special group or purpose such as individual tests for deaf children, group tests of children enter-

ing the first grade, or the senior high school, or college, etc. It is being widely recognized, moreover, that to use any intelligence test validly requires much experience and insight. For example, the question of whether a third grade pupil who is a poor reader can or cannot be properly tested by a group test requiring some reading, and when a two-year-old child is sufficiently free of emotional blocking to make his best response, are nice problems which require an expert for a correct solution. If the conditions and test are not exactly right, a correct measurement of intelligence cannot be assured.

Before attempting to define more exactly what the intelligence tests measure, or what, exactly, is meant by intelligence, it will be advisable to examine two ways in which intelligence test results are expressed and some of the assumptions underlying these expressions.

MENTAL AGE AND INTELLIGENCE QUOTIENT

The Mental Age. To make the subject's score on an intelligence test meaningful, a standard of comparison must be provided. The method adopted by Binet, and by many others later, was to use the average performances of individuals of different ages as a standard of comparison. Binet ascertained just what was the average score achieved by a representative group of three-year-old children, four-year-old, etc. It was then possible to state a child's achievement in terms of the age at which the child of average ability would secure the same score. This score is called the "mental age" or the "M.A." for short.* Thus, a particular child whose achievement in the test is equivalent to the mental age of ten years has the general mental ability of the average ten-year-old; it matters not what the actual chronological age of this child may be.

The mental age, then, gives us a statement of the general mental ability of a subject as measured by this test *at the time the test was given*, in comparison with average children of different ages. If a ten-year-old child earns an M.A. of ten, he

* The more abbreviated forms, "MA" and "IQ", are sometimes used

has *average* mental ability. If he earns an M.A. of eleven years he is obviously superior to the average; if he earns an M.A. of eight years, he is markedly inferior. The mental age is really a statement of a child's mental maturity at the time, and this implies, of course, that general mental ability grows or matures. General mental ability as measured by the Binet test grows gradually and more or less uniformly to a maximum or maturity. The age of maturity has been placed variously from sixteen to twenty-two years. The age of maturity seems to be different for different tests. Individuals, moreover, mature at different times mentally as they do physically.

The Intelligence Quotient. The intelligence quotient or I.Q. is obtained by dividing by the chronological age the mental age received on a test like the Stanford-Binet. For example: Pupil *A* has an M.A. of 10 years and a chronological age of 10 years. Divide M.A. 10 by C.A. 10, the intelligence quotient is 1.00; Pupil *B*, whose chronological age is also 10, has an M.A. of 12, 12 divided by 10 gives an I.Q. of 1.20. Pupil *C*, also 10 years of age, earns an M.A. of 8, which, divided by 10, gives an I.Q. of 0.80. Usually the decimal is disregarded; we say that *A* has an I.Q. of 100, *B* of 120, and *C* of 80. The intelligence quotient is obviously a ratio — the ratio of the mental age to the chronological age.

If the I.Q. should remain constant, or nearly so, for several years under normal conditions, it would be a useful device for two purposes. It would indicate the rate of mental growth in the future and express a person's *relative* mentality or brightness. An I.Q. of 100 would mean that the child probably has grown, is now growing, and will continue to grow in mental ability at the average rate. An I.Q. of 120 would mean a growth 20 per cent more rapid; an I.Q. of 75 would mean a growth 25 per cent less rapid than the average. Even if the I.Q. should not remain the same from year to year, it would nevertheless express the relative brightness or dullness of an individual at the time the test is given. Thus, irrespective of age, an I.Q. of 100 would mean average mental alertness,

suppleness — or whatever mentality is — whereas a higher I.Q. would indicate superiority in these respects and a lower I.Q. inferiority. It is, accordingly, a convenient device for picturing an important aspect of mentality.

Now that we have seen samples of the tasks presented in the Binet and other tests, and have observed certain facts concerning the scores obtained from such tests, we must inquire what these tests do actually measure and what intelligence is. This is a very important and difficult problem. It is important because the practical value of a test depends on knowing what it measures; difficult, because many lines of evidence, some of it highly technical, must be considered to determine what any test measures. Let us begin with a brief report of certain very technical approaches to the problem of discovering the basal characteristics of intelligence.

STATISTICAL ANALYSES OF THE NATURE OF INTELLIGENCE

Beginning at the turn of the century, or about the time Binet began his work, there have been a series of ingenious statistical studies of intelligence tests designed to reveal whether intelligence is general, operating everywhere and on everything like a single general power or faculty, or whether intelligence is specialized or even specific. Five men have been especially prominent in this type of work: Spearman and Thomson in England, Thorndike, Thurstone, and Kelley in America. Each of these men has reached conclusions that correspond fairly closely either to those of Spearman or of Thorndike, who were the first to enter the field. We shall consider only the theories of these two leaders.

In 1904, Spearman announced his original theory which held that intelligence consisted of two factors — a general intellectual factor, *g*, and several specific factors, *s*. Any intellectual task consists of the operation of the general factor and several specific factors. Later he added certain group factors which are less general, widespread, and homogeneous than *g* and more so than *s*. The group factors would be found in

many intellectual activities — more than the *s* or specific factors and less than the *g* or general factor. Thus a child's ability in reading might be attributed in part to his degree of general intelligence (the *g* or general factor), in part to such a group factor as talent for using words or verbal ability, and in part to efficiency in perceiving printed words, sensing the phonic or auditory features of words, and other abilities specific to reading. The main matter of dispute has been the general factor, in this case, general intelligence. Spearman has conceived this general factor as a form of general mental energy which would be involved in various degrees in various tasks.

Thorndike over the years has been opposed to Spearman's idea of a general, homogeneous, intellectual factor and to the notion that the basis of such a factor could be a fund or form of mental energy. He feels that this view oversimplifies the facts. He prefers a view in which intellectual tasks are carried out by a complex nervous system operating in many different total patterns — patterns too complex and varied to be fully described as mere mixtures of a certain amount of one homogeneous *g* and a number of specifics, or as a general factor plus certain group factors, plus specific factors.

The vast amount of statistical work done on the problem has at least shown (1) that what is measured by such an intelligence test as the Stanford-Binet does enter into innumerable activities in everyday life; (2) that it influences achievement in some activities (such as learning to read) much more than it does others such as learning to catch a baseball, and that (3) the ultimate physiological or psychological explanation of intellect is still an uncertainty — still a problem of specialists in the future.

For those engaged in education, a practical understanding of the intelligence tests is, however, of great importance. We shall try to provide such an understanding, first, by offering a preliminary "common-sense" definition; second, by giving results of studies designed to reveal the extent to which intelli-

gence is affected by heredity on the one hand and environmental factors such as home and school life on the other; third, by giving some of the results obtained from using the intelligence tests and comparing results of scores on such tests with abilities shown in schoolwork in general and in special school subjects and in other phases of life; and finally by considering intelligence tests in comparison with tests of "special aptitudes" such as talent for music or reading

A PRELIMINARY DEFINITION OF INTELLIGENCE

Let us approach a definition of intelligence by considering the test elements of such a scale as the Stanford-Binet and merely noting what they seem to measure.

Among the 129 tests in the Revised Stanford-Binet Scale are many which measure the ability to manipulate, mentally, familiar facts, such as repeating digits forward and backward, counting backward, visualizing changes of the hands of the clock; to reason out the solution of problems that utilize the facts of arithmetic, of physical relations, and of practical situations. In some tests, the knowledge of abstract facts and relations is demanded; for example, in defining such words as pity, revenge, charity, envy; in giving the similarities in three things, such as wool, cotton, leather, the differences between laziness and idleness or between poverty and misery; in grasping the thought contained in a short paragraph, or in giving the meaning of pictures or fables. In general, the Binet test seems to include a variety of tasks on which depend the mental abilities to be described later in our chapters on learning, the acquisition of ideas, especially abstract ideas, and reasoning or problem solving. Indeed, it appears that the aims of Binet and his followers were precisely to secure tests of various abilities to learn, especially to learn complicated and abstract facts, and also to profit by experience in a general way. They tried to secure tests that would indicate ability to adapt oneself to new situations, to see the problem, hold it in mind, and reason out the solution. In these tasks, it is assumed

that mental alertness, keenness, quickness, and breadth of grasp, as well as suppleness, accuracy, and control, would be involved.

It may be said then that intelligence has been conceived by many persons as *a composite or organization of abilities to learn, to grasp broad and subtle facts, especially abstract facts, with alertness and accuracy, to exercise mental control, and to display flexibility and sagacity in seeking the solution of problems.* It may be further stated that these abilities were conceived to be native by Binet, Terman, and many others. This fact is shown by Binet's efforts to secure in his scale the kind of problems that were based upon facts that all children would have ample opportunity to learn under reasonably normal conditions, but problems that no, or few, children would have been trained to solve in exactly the way they were presented in the tests. By trying to avoid the influence of special home or school training in this way, Binet hoped to reveal native intellectual aptitude and capacities. To what extent intelligence as measured by the Binet and other tests is native is a matter of dispute which we must take up for more extended consideration.

It should be understood that the definition suggested above is a general, indeed, a "common-sense" one. Its purpose is to give the reader a general idea of what the test measures. The experts in the field have suggested many other definitions, many of them briefer. All such definitions are of less value than the understanding of the relationships of scores on the intelligence tests with various school, vocational, and other abilities, to which we shall turn our attention in the next chapter. Of greatest importance, moreover, are the results of the studies conducted to determine the extent to which the score, such as the I Q., on the intelligence tests is due to the heredity or environment. This question will be considered next.

INFLUENCE OF NATURE AND NURTURE ON INDIVIDUAL
DIFFERENCES IN INTELLIGENCE

That the effects of heredity and environment are interwoven from the time of birth, that they cannot be isolated and studied in pure form, is now generally agreed. On the question: What is the relative effect of heredity and environment on intelligence and other human characteristics? there is, however, great disagreement. This is largely due to the fact that experimental approaches to the problem must be indirect, and each type of approach leaves certain important factors in a state of uncertainty. It will therefore be advisable to give a few illustrations of the types of study undertaken.

One procedure is to study the resemblances between parents and children, and between twins and siblings who share the same home environment; another is to study the resemblances between individuals who are not blood relatives but who share the same environment (as in the case of foster children and foster parents); another is to compare the results of "before and after" tests of children who have moved from one environment to another or for whom special educational provisions have been made.

Resemblances between Parents and Children. The common saying that "brains run in families" is based upon the practical observation that in almost any community one can find parents and children who similarly have high or low intelligence. Examples of this sort are quite impressive, as are the many detailed genealogies that show high ability or feeble-mindedness appearing in each of several generations. Exceptions to such resemblances between parents and children can also be noted, however, and they can be accounted for genetically, that is, by current theories of heredity. Many studies have therefore been made to determine the extent to which children resemble their parents and other ancestors.

Resemblances often studied by statistical correlations. One means of measuring the resemblance between parents and children

is to find the statistical "correlation" between their scores on mental tests. A word about correlation is in order, since the term will recur in the ensuing discussion. This statistical procedure yields what is known as a "coefficient of correlation." The coefficient, which may range from a negative value of -1.00 to a positive value of $+1.00$, gives a quantitative indication of the extent to which two factors are co-related. If fathers and sons, for example, always had precisely the same intelligence, then a correlation between the scores of any normal sampling of fathers and their sons would be 1.00 . If there were no relationship at all between the intelligence of fathers and sons, the correlation between paired members would be zero. If sons were always bright or dull in inverse proportion to the brightness or dullness of their fathers, the correlation would be -1.00 .

Correlation does not imply causality. If two factors are causally related, so that a given degree or magnitude of one is associated with a corresponding degree or magnitude of the other, there will be a positive correlation between measurements of each factor; but a correlation does not necessarily mean that one factor is the cause of the other. For example, since the corn crop is usually good when there is plenty of rain, the average per acre yield in a given county for twenty years is likely to show a high correlation with average rainfall during the corresponding years. The correlation is not likely to be perfect ($+1.00$), however, since many other factors such as the lateness of the spring, temperature, and the evenness of distribution of the rain during the growing season will also affect the crop. It is likely that a positive correlation would also be found between the annual corn crop and number of mosquitoes; this cannot be interpreted to mean that the corn caused the mosquitoes or the mosquitoes the corn — the relationship may be due to the fact that the crop and mosquitoes both are causally related to the rainfall or some other factor.

Pearson's study of parent-child resemblances. The method of correlation was first applied extensively to the measurement

of resemblances between blood relatives by Pearson, in 1904.¹ When parents and children were compared on the basis of a number of physical characteristics, the resulting correlations were about $+ .50$. When parents and children were compared with respect to their scores on measurements of certain mental operations, the correlations also clustered around $+ .50$. This figure represents a moderate, but far from perfect, resemblance, and Pearson therefore concluded that physical and mental characteristics in men are inherited "within broad lines, in the same manner and with the same intensity"

Other investigations of parent-child resemblances. Since the time of Pearson's studies, numerous similar investigations have been made, utilizing standardized intelligence tests. In one such study (by Conrad and Jones),² father-son, father-daughter, mother-son, and mother-daughter comparisons were made on the basis of tests of about a thousand persons, representing 269 family groups that constituted a cross section of a New England community. The parent-child correlations clustered about $+ .50$. Other studies have likewise found correlations of about this magnitude, sometimes somewhat lower, seldom much higher

It may be noted, in passing, that the correlations between parents and children of the same sex (father-son, mother-daughter) have been found to be about the same as correlations between the opposite sexes (mother-son, father-daughter). There is no evidence that in a normal sampling of the population one parent will contribute more or less than the other to the intelligence of sons or daughters.

Resemblances between Siblings and Twins. Correlations varying from about $+ .35$ to $+ .50$ have also been found in comparisons between siblings (brothers and sisters who are not twins) living in the same home. Comparisons between twins are especially interesting, since twins can be classified into two groups, *identical* and *nonidentical*. Identical twins (also called *uniovular* and *monozygotic*) are believed to develop from the same fertilized egg, while nonidentical twins

develop from two separate fertilized eggs and therefore, as far as original germ plasm is concerned, are as distinct as brothers and sisters who are born at different times. If heredity were a potent factor, one would expect a considerably higher degree of resemblance between twins that apparently have developed from the same ovum, and therefore presumably have the same heredity, than between nonidentical pairs. This has been found to be the case. Correlations of $+ .80$ or higher have been found in comparisons between identical twins reared in the same environment. On the other hand, correlations between nonidentical twins tend to fall in the range $+ .50$ to $+ .70$, which is about midway between the range for identical twins ($+ .80$ to $+ .90$) and the range for ordinary brothers and sisters ($+ .35$ to $+ .50$).

Resemblances between Relatives Living Apart and Non-relatives Living Together. The findings cited above concern children living together with their own parents and therefore sharing the same general environment. In these cases, the influence of heredity is obscured by the role of similar environment. In comparisons made between blood relatives who have been reared in different environments, it has been found in most studies that resemblances will appear. This fact suggests that heredity contributed to the resemblance normally found between blood relatives. There has been considerable disagreement, however, as to the relative effect of the hereditary factor.

Cases have been noted in which identical twins who have been reared apart show an almost incredible resemblance to each other in mental ability and other characteristics. Dissimilarities have also been noted, however, in many cases. Although findings in different studies have varied somewhat, it appears that, barring accidental happenings or extreme deprivation, identical twins reared in different home environments are likely to show a higher resemblance in intelligence than is shown by siblings living in the same home. This fact suggests that heredity is a potent factor.

Numerous studies of resemblances between foster parents and their foster children, who live in the same home environment but do not share the same immediate heredity, have been undertaken to weigh the relative influence of heredity and environment. Several factors complicate the interpretation of the results of such studies. One is the effect of planning and selection which is usually involved in the placement of a child for legal adoption. For example, the babies who seem to be most promising (as judged by the child's manifest characteristics and information concerning his true parents) are more likely to be placed on the adoption lists than those who are clearly defective. To the extent that such selection prevails the average intelligence of children available for adoption will be somewhat above that of the general population. Further, effort is often made to "fit the child to the home," to provide, for example, a baby who is "college material" for a home in which the foster parents are college graduates and are engaged in one of the so-called learned occupations. To the extent that such selective placement prevails there will be some resemblance between foster parents and their foster children quite apart from the effect of the common environment.

In one carefully controlled study (by Burks)³ that included measurements of "own" children living with their families and of foster children who had been placed in the adoptive homes at an average age of three months, it was found that the correlations between parents and their own children were higher than the correlations between parents and foster children. Burks estimates that heredity accounts for as much as from seventy-five to eighty per cent of measurable differences in intelligence. In another study (by Leahy)⁴ it was also found that correlations between "own" parents and children were considerably higher (clustering around .50) than between foster parents and foster children (clustering around .20). Moreover, the results indicated that even these relatively low correlations between foster relatives were influenced to a large degree by the factor of selective placement. The effects of the

foster home environment appeared to be considerably greater in other studies. In one, for example (by Freeman, Holzinger and associates),⁵ it was found that foster children showed gains after adoption and that such gains were larger in the case of children placed in the better homes. In another study,⁶ children who had been living in foster homes showed a higher average level of intelligence than might have been expected in the light of such information as was available concerning their true parents.

Differences in method, in the populations involved, and in the findings obtained in studies of foster children make it very difficult to give a definite statement of the probable effect of a common heredity, as distinguished from a common environment, on the resemblances normally found between the intelligence of parents and their own children. It may be stated, however, that there is usually some resemblance between the intelligence of parents and their children even though they have been separated from the time when the children were very small. There is likely to be more resemblance between foster parents and foster children than could be expected by chance, but this resemblance will be smaller than that found between parents and their own children, and such resemblance as is found may be influenced to varying degrees by the factor of selective placement. In individual cases, a foster child may show a high level of intelligence that seems to be quite out of line with such facts as are known concerning the abilities of his true parents. However, it also is true that large discrepancies sometimes appear between parents and their own children who live in the same environment. It should be repeated, however, that such discrepancies are easily accounted for in terms of heredity. When a foster child thus outstrips his true parents it is, therefore, rarely possible to determine definitely whether the foster home environment enabled the child to capitalize upon inborn potentialities or whether the favorable environment provided by the foster home produced a genuine gain in intellectual capacity.

Influence of the Educational Environment on Intelligence. In studies of individuals as well as of groups it frequently has been found that "before and after" tests reveal changes in intelligence after children have been transferred from one environment to another. Gains have also been found after children have moved from orphanages to homes or from underprivileged rural communities to an urban center. In individual cases, large gains may occur. Wide individual fluctuations, however, may be the result of an earlier rating that was spuriously low by reason of faulty administration of the test, lack of cooperation by the child, or other factors associated with the test situation. A certain amount of gain following a change in environment may reasonably be expected if items of a test deal with specific matters of knowledge (such as knowledge of the value of coins, the days of the week) that the child would not normally have a chance to acquire in his earlier environment.

The Effect of Nursery School Experience on the I.Q. The question as to the possible influence of the environment assumes concrete significance when we inquire into the effect of a child's schooling on his level of intelligence.⁷ In some such studies, children who have attended nursery school have revealed gains as shown by retests and by comparison with control groups of nonattenders. In numerous other studies, no significant gains have been found that could be attributed to nursery school experience. When children of preschool age have been exposed to repeated tests, it frequently is found that the group average on the final test of a series is higher than the average on the first test, but such gains also have appeared in the case of retested control groups.

In the studies in which nursery school experience seems to have produced gains, such advances have generally been larger in the case of younger children within the preschool range than in the case of older children, and have been more pronounced during the first year of attendance than during the second or later years. Further, the gains have been found to occur pri-

marily (but not exclusively) among children who were near average or below average (as compared with their associates in a given group) rather than among the brightest children.

One of the studies ⁸ in which nursery school experience is reported to have produced gains in I Q was conducted in a large orphanage in which a nursery school was established that was attended by some children but not by others. The conditions in the orphanage were generally quite unfavorable as compared with the average home. One comparison shows that children who attended the nursery school for average periods of about twenty weeks showed an average gain of 4.6 points of I.Q. while control subjects showed an average loss of the same amount during the same period.

Significance of I.Q. gains in young children. When gains in I.Q. do appear after nursery school attendance, there is the question as to what the gains really mean: to what extent do they represent a genuine increase in the child's intellectual stature, to what extent a mobilization of inherent powers that were there from the beginning, to what extent are the gains simply a by-product of unreliabilities in the mental tests for very young children? The latter question is crucial, since intelligence tests at the preschool level are not as reliable as are tests at later age levels,⁹ and even if the measuring scale as such were perfect it still is more difficult to obtain a genuine rating at the earlier levels than at a later time. A child may, for example, be uncooperative when he is tested the first time and his low score may not at all represent his real ability; then, after having had experience with the nursery school locale, routine, and personnel over a period of some months, he may show a high degree of cooperation on a later test and earn a considerably higher score. In a study by Rust ¹⁰ it was found that by virtue of lessened resistance through further contact with the examiner, individual children showed gains of as much as thirty-five points of I Q. within a few days. Such a gain does not mean that the child has become correspondingly brighter by virtue of having gone to nursery school. This resistance factor

is not, of course, encountered similarly with all children, and the average shift in scores by virtue of this factor when large numbers of children are tested is not likely to be large; but it represents one of many factors that complicate mental testing at the preschool level and that may contribute to gains that are more apparent than real.

Influence of nursery school attendance on the I Q controversial The question as to whether nursery school attendance is likely to produce a significant gain in I Q is still a controversial one. Among the studies that have been made to date in a large number of different institutions, those that report no gain, or negligible gains, outnumber those in which gains have been found. The issue cannot be settled merely by counting the studies *pro* and *con*, however, for failure to find gains in one population (such as a population of children who come from good homes and who perhaps receive optimal mental stimulation in their everyday environment outside of school) would not negate gains that might be shown in another population (such as a group of children for whom the nursery school environment definitely provides mental stimulation of a sort not provided at home). There is also the possibility that some nursery schools provide a better stimulus to mental growth than do others. Future research will be required to give us a wholly reliable appraisal of the effects on the I.Q. of superior education at the nursery level. At the present time, however, it may be said that there is some evidence that a shift from a very poor to a very good environment at the nursery school age may increase the score on the intelligence test.

Effect of Different School and Out-of-School Environments on the I.Q. Apart from variations in the home environment, there are large variations also in the intellectual environment afforded by children's companions, their teachers, and the programs of the schools they attend. According to one study of institutional children, for example, a child's I.Q. will tend to decline or to rise somewhat toward the level of his group after he has spent some time with children whose

intelligence is lower or higher than his own.¹¹ Although this finding cannot be regarded as an established fact (it lacks statistical reliability) an effect of this sort might conceivably occur, but it does not follow that a child's I.Q. is entirely at the mercy of his everyday environment. As Hollingworth has shown in her studies of gifted children, bright children frequently forge ahead in their intellectual development, show extremely high I.Q.'s, and acquire precocious intellectual interests, even though they have been born into poor circumstances and have spent several years in classes with children of average intelligence, sometimes under unsympathetic teachers. In like manner, as can be noted in observations of children in everyday life, a dull youngster may spend many years in the society of people who are considerably brighter than he and still maintain much the same I.Q. from year to year.

Influence of the elementary school program on the I.Q. Of special interest from an educational point of view is the question whether schools and educational programs at the elementary school level might differ in their "intellectual stimulus value" so that a child might show a rise in I.Q. if he attends one school and might merely hold his own, or even show a loss, if he attends another. The limited evidence on this question indicates that the differential effect of the general run of school programs is likely to be small. In one study it appeared that schools differed in their stimulus values as determined by remeasurements of pupils who had attended them over a period of time.¹² In a study by R. L. Thorndike and his associates,¹³ comparisons were made between the initial and terminal I.Q.'s of children who had spent two or more years in three outstanding schools. In two of the three schools, there were no significant changes in the average I.Q.'s of the pupils. In the third, the pupils showed an average gain of six points, but the investigators could not ascertain to what extent this increase might represent a true gain that could be attributed to the educational program and to what extent it might be due to fortuitous circumstances, such as the fact that the

mental testing program in the school where the gains appeared was less systematic than in the others. Whatever was their cause, the gains did not appear to be cumulative, for the increase in the average was just as large when initial scores were compared with retests after one year of attendance as it was when initial scores were compared with retests after longer periods of attendance

Influence of special education for bright and dull children. Interesting data concerning the effects of improving elementary schooling on the I Q are provided by a school (Speyer School, P S. 500, New York City) established to provide the best possible education for pupils within two ranges of I.Q., the "Binet Pupils" — those with I Q.'s between 75 and 95 — and the "Terman Pupils" — those with I Q.'s above 130. Seven classes of "Binet Pupils" and two classes of "Terman Pupils" were gathered from neighboring public schools and from similar, typically poor homes, economically. Every effort was made to give all the classes superior equipment, teachers, services of specialists, and other advantages not enjoyed previously. Later checks showed that both the "bright" and the "low-normal" pupils benefited from the program in many ways, but not by consistent gains in I.Q.¹⁴ After several years in this special school, the difference between the "Binet" and "Terman" groups remained practically the same. Although there were variations up and down in I.Q. among the individuals in both groups, the averages of both were almost exactly as they were at the beginning of the school. The bright remained equally bright; the dull remained dull. No child entering the Binet class could qualify for the Terman class, and no child in the latter lost enough points I Q. to give any possible reason for shifting him to the former.

Summary and Discussion. Discussions of the relative influence of heredity and environment on intelligence frequently have involved much controversy and dogmatic statements of extremist viewpoints. Likewise, the problem has sometimes been confused by irrelevant issues, such as the

assumption that those who emphasize the importance of heredity are "reactionary" while those who emphasize the environment are "liberal" or "progressive." Actually, of course, such labels have no place in connection with an issue that should be decided in terms of objective findings. Although an extreme environmentalist position is likely to win much popular applause, it may do much damage. It may raise false hopes and place demands upon parents and teachers that cannot be fulfilled. The assumption that a sufficiently stimulating environment can raise a child from a dull or average to a superior level may lead ambitious parents and teachers to overstimulate and overdrive children to a serious extent. It may lead a child's elders to blame themselves or the teachers if a child maintains approximately the same level of intelligence from year to year. An extreme hereditarian position likewise is damaging if it is accompanied by snobberv, class consciousness, and denial of opportunity to each person, or the lack of respect for what excellent guidance and education can accomplish without increasing the I Q. It would be especially unwholesome if accompanied by the view, which the facts do not justify, that every child's I Q can be determined once and for all time when he enters school. To regard the I Q. as the sole criterion for the classification of pupils or for the provision of educational opportunities is likewise an unsound educational practice, as will be pointed out more fully later in this book.

The discussion above brings out the point that both heredity and environment play an important role in determining human capabilities. Inherited potentialities reach their fruition only through the environment. In cases of severe environmental deprivation, an individual's score on an intelligence test may fail to represent his potential ability, and his score may rise in a more auspicious environment. In the case of children from the general run of homes, in an average community with average educational and cultural opportunities, the likelihood is small, according to the weight of present

evidence, that there would be a very substantial increase in average intelligence, as measured by current tests, if children were shifted to presumably better homes or if special educational provisions were made. Big increases appear to be especially unlikely after the age of six years; there is, however, the possibility that greater change may be secured by extreme improvements in environment before that time.

SUMMARY AND CONCLUSIONS

We have by no means canvassed all the facts of importance in determining the fruitful, professional uses of intelligence tests. Many of these will be presented in the next chapter. Before turning to it, we may briefly summarize the more important findings in the present chapter.

1. The intelligence test was developed to meet the urgent need for some relatively simple measurement of general mental ability or capacity.

2. Since the beginning of the present century, a large number of intelligence tests have been developed for different purposes: carefully worked out individual tests for children of different ages; group tests for all ages, and special tests for deaf pupils, persons unable to speak English, unable to read, etc.

3. Certain methods of expressing intelligence such as the mental age or M.A., and the intelligence quotient or I.Q., have become widely used. The M.A. is the measure of level or maturity of mental development; the I.Q. is a ratio which compares a person's status with the average of the same age. It is often called the "brightness" measure.

4. Although no single technical definition of intelligence has been accepted, the following is suggested as a practical conception of intelligence for the educator: *Intelligence is a composite of many abilities to learn, to grasp broad and subtle facts, especially abstract facts, with alertness and accuracy; to exercise mental control; and to display flexibility and sagacity in solving problems.*

5. In general, it is found that parents of high intelligence tend to have offspring of higher intelligence than do parents of

low intelligence, and *vice versa*. Parents of superior intelligence, however, tend to be of superior economic status and provide a better environment, both home and school, than parents of inferior intellect. Consequently their children have the advantage both in heredity and environment. This is the *general* rule; but there are many exceptions. The correlation of the I Q of parents and offspring, as was noted above, is about + .50 — which means a fair but far from perfect relationship.

6. Very high I Q's will occur only rarely in families of average intelligence and still less often in families of very low intellects. Likewise, very low I.Q.'s will appear to a certain extent in the families of average I Q.'s and much less frequently in the families of very high intelligence. It is, therefore, obvious that the intelligence of any particular child cannot be foretold from knowledge about his parents or his home environment. It must be determined by some practical test. This, of course, is the reason for developing and using intelligence tests.

7. Although under typical conditions of a representative American home and school life, the I.Q. of the *majority* of children remains about the same from the first grade onward to the end of schooling, there are occasional instances of large changes. Large gains may be due to removal of emotional blockings or other interferences with maximum performance in the test or to improved education or other factors, and losses may be due to the opposite changes. In some cases, even the experts are puzzled to account for the shifts. I.Q.'s taken before entering school, especially in infancy, are even more likely to vary on later tests. For these reasons, it is no longer safe to assume that a person's I Q. can be determined exactly once and for all by a single test, even if the test is given by a shrewdly expert examiner. The importance of the I.Q. is so great that it should be redetermined from time to time by an experienced examiner.

8. The variations of I.Q. from time to time, for whatever cause, are sufficiently marked to make the fact of change, in and of itself, an important educational fact — and a problem

meriting careful study. This is a second reason for repeating the intelligence test at intervals.

Finally, it must be repeated that the practical use of intelligence tests depends upon other facts to be presented in the next chapter. A more complete discussion of the uses of intelligence tests in education will not be undertaken, therefore, until these data have been considered

QUESTIONS AND EXERCISES

1. What are the differences between a verbal and a nonverbal test? Which of these two types of tests is likely to be more influenced by a typical American school program?
2. What is the difference between mental age and the intelligence quotient?
3. In what respects, if any, does the "common-sense" definition of intelligence given in the text differ from your own notion of what intelligence is?
4. It is quite well established that, in general, the children of well-to-do parents have higher I Q's than children of poorer parents. Just what conclusions can we draw from this fact concerning the influence of heredity and environment upon the I Q?
5. Now that you have read the brief summary of data bearing on the influence of heredity and environment upon intelligence as given in the text, how would you summarize briefly the present status of this problem? Do you feel, in general, that the situation is rather clear, or is it still very uncertain?
6. During what years would you think teaching and environment would have the greatest effect upon the I Q? Why?
7. Of the various studies on the environment versus heredity controversy reported in the text, which ones do you consider more important? Which ones less important? Why?
8. What position, precisely, does the text take concerning the question of the constancy of the I.Q.? What cautions does the text recommend practical workers take until more is known about fluctuations in the I Q?
9. Following are definitions of intelligence offered by other writers. Which of these are most serviceable and valid?
 - a "The general capacity of an individual consciously to adjust his thinking to new requirements." — Stern.

- b* "An individual is intelligent in proportion as he is able to carry on abstract thinking" — L. M. Terman
- c*. "To judge well, understand well, reason well, these are the essentials of intelligence." — Alfred Binet.
- d*. "Intelligence seems to be a biological mechanism by which the effects of a complexity of stimuli are brought together and given a somewhat unified effect in behavior" — Joseph Peterson
10. Basing your opinion on the facts presented in the chapter, does it appear that the definitions above are too broad or too narrow to *define* what the present tests actually measure?
 11. Aside from tests, what features or kinds of behavior disclose in some measure the degree of intelligence that a person may have? For example, are table manners or English usage indicative of intelligence?
 12. In which of the following types of work is a high degree of intelligence probably useful or necessary. driving an automobile, fishing with nets, splitting wood, taking shorthand dictation, barbering, preaching, teaching, running a riveting machine, writing poetry, selling toy balloons, selling bonds? In which of these activities are traits other than intelligence important? What traits?
 13. What services could an expert in intelligence testing render to the work in (a) a juvenile court, (b) a hospital for neurotic children, (c) a public school; (d) a criminal court, (e) a home for orphans; (f) an automobile factory, (g) a large department store; (h) an immigration bureau; (i) the army or navy?
 14. Explain in some plausible way the fact that intelligent people, on the whole, are less conceited than dull people are.
 15. A boy of 10 with an I. Q. of 140 would have what mental age? A boy of 14 with an I. Q. of 100? In what respects would these two boys resemble each other or an adult with an M. A. of 14? In what respects would the three be very unlike?
 16. When a person's I. Q. becomes higher or lower on a retest, does it necessarily mean that his intelligence has changed correspondingly?

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CHAPTER VIII

The Practical Uses of Intelligence and Other Aptitude Tests

In the preceding chapter we discussed the development of intelligence tests and the meaning of mental age (M.A.) and intelligence quotient (I.Q.) It was found that, although it had been hoped that the intelligence test would yield a measure of general mental aptitude little subject to the effects of environment repeated measures of an individual at intervals usually show some variation. Although the fluctuations in I.Q. thus obtained are mainly small, they are occasionally large enough to be of practical importance. Since one cannot certainly tell in advance which children will show the largest changes, it is advisable to administer the test to all school children at intervals

In the present chapter, we shall make further inquiries about the practical significance of intelligence tests before giving suggestions for using them in schools. The first question to be raised is: How well does the intelligence test score correlate with, and foretell, general achievement in various school subjects and in other activities in school and elsewhere?

THE RANGE OF INDIVIDUAL DIFFERENCES IN INTELLIGENCE

Before taking up the correlations of intelligence and achievement in various lines, we should show the character of individual differences in terms of the measures obtained from the Binet tests. The most convenient way is to show the distribution of I.Q.'s obtained on the Stanford Scale, the most widely used revision of these tests.

The curve in Fig. 10 shows the distribution of I.Q.'s found among 2904 children selected by Terman and Merrill to form the standardization group for the Revised Stanford-Binet scales. Adjustments in the means of the various age groups have been made to correct for too large a selection of subjects from the upper socio-economic levels. Generalizing from such

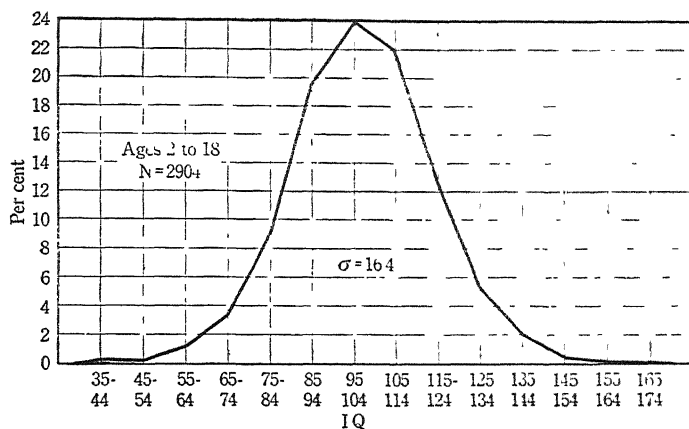


FIG. 10 DISTRIBUTION OF COMPOSITE L-M I.Q.'S OF THE STANDARDIZATION GROUP

This figure gives the distribution of the composite of the adjusted Form L-M I.Q.'s for the standardization group in terms of the per cent of cases at each of the ten-point I.Q. intervals. This is probably the clearest picture available of the intellectual differences among American-born white children two to fifteen years of age. (Reproduced by permission from L. M. Terman and A. A. Merrill, *Measuring Intelligence*, Houghton Mifflin Company, 1937, p. 37.)

data as these, it is estimated that the distribution of intelligence, as measured by the revised Binet Scales, in the population at large is about that given in the table on page 258.

Keeping in mind our provisional definition of intelligence as a composite measure of capacities to learn, to grasp broad and subtle facts with alertness and accuracy, to generalize and display sagacity in reasoning and problem solving, we may now seek to determine more exactly the relation between intelligence and various forms of achievement.

TABLE X

PERCENTAGE DISTRIBUTION OF COMPOSITE
L-M INTELLIGENCE QUOTIENTS OF THE
STANDARDIZATION GROUP (2904 CHILDREN) *

| <i>Classification</i> | <i>I Q.</i> | <i>Percentage of All Children Included</i> |
|-----------------------|-------------|--|
| Very superior | 160-169 | 0 03 |
| | 150-159 | 0 2 |
| | 140-149 | 1 1 |
| Superior | 130-139 | 3 1 |
| | 120-129 | 8 2 |
| High average | 110-119 | 18 1 |
| Normal or average | 100-109 | 23 5 |
| | 90-99 | 23 0 |
| Low average | 80-89 | 14 5 |
| Borderline defective | 70-79 | 5 6 |
| Mentally defective | 60-69 | 2 0 |
| | 50-59 | 0 4 |
| | 40-49 | 0 2 |
| | 30-39 | 0 03 |

INTELLIGENCE AND SCHOLASTIC ACHIEVEMENT

Inferior Intelligence. Intelligence quotients of 20 or less are found infrequently. Persons with I.Q.'s in this range are "idiots," essentially incapable of learning. Individuals with I.Q.'s from 20 or 25 to 50 or so are ordinarily called "imbeciles." All within this range are capable of but meager learning and adaptability. In the range from 59 to 70 I.Q. are found various degrees of "feeble-mindedness" or "mental defectives," which grade quite imperceptibly into the less, but nevertheless seriously, dull individuals above, often called "borderline defectives." Throughout this enormous range, from approximately 0 to 70 I.Q., there is absolutely no doubt about the innate limitations upon the acquisition of complex mental functions, and the rate of acquisition where learning is possible at all. It is almost invariably futile to attempt to teach children of I.Q.'s less than 50 to read, spell, or do arithmetic. Genuine comprehension in reading or arithmetic can

* Adapted from M. A. Merrill, "The Significance of the I.Q.'s on the Revised Stanford-Binet Scales" ¹

seldom be achieved even by those whose I.Q.'s fall between 50 and 60, and the little they do learn must be the result of arduous and prolonged application.

In the average case, an I.Q. of 75 is considered about the minimum essential for appreciable achievement in the "academic" portions of schoolwork, but many with that degree of intelligence fail almost entirely, and, at best, progress is slow and soon halted. In the schools most of the pupils recognized by teachers as "very dull" and "very slow" will be found to have I.Q.'s between 70 and 85. Most of these children are retarded in their school progress.

Children with an I.Q. within the range 85-95 have difficulty keeping pace with the typical class, but as Burt² found among London children those with I.Q.'s in this range tend to achieve the most in proportion to their innate ability. "There is discernible an effort, and an effort by no means sterile, to coax and coach these milder dullards to a grade more closely fitted to their actual age." But Burt, like many others, found that despite coaxing and coaching, these children seldom equal the pupils of average endowment (*i.e.*, with I.Q. of 100). That they find the typical "academic" high school difficult is indicated by many studies such as one by Proctor,³ who found (in 1918) that in the first year of high school 70 per cent of those with I.Q.'s of 95 or less failed in more than half of their studies.

Average Intelligence. Children of average intelligence — those whose I.Q.'s cluster closely about 100 — usually set the pace in the grades. Examining the records of 200 pupils whose I.Q.'s range from 95 to 105, Terman found that, aside from retardations clearly due to loss of schooling through illness or other causes, nearly all had made regular progress. The range 95-105 I.Q. includes about thirty-three per cent of the general population and probably about forty per cent of the population of the elementary schools.

Superior Intelligence. The total number of children above 105 is about the same as that below 95; namely, about

thirty-three per cent. The former exceed the average in intelligence as much as the latter fall short of it. Since the I.Q.'s are really ratios of mental growth, it is held by many that the rate of progress through school should show similar ratios. That is, if the child with an I.Q. of 100 progresses at a given rate, one with an I.Q. of 75 should progress 75 per cent as fast; one with an I. Q. of 125 should progress 25 per cent more rapidly than the average; and so on. But just as the children between 85 and 95 are coaxed and coached along because they need it, and are promoted to keep the age group intact, there is always the likelihood that those above 105 will be given less attention merely because they can "keep up with the class" with little teaching. Extra promotions of children of 100-110 I Q are therefore not numerous, and proper enrichment of the program is often not provided for them when they are retained in the class corresponding to their age.

Of fifty-four children between 120 and 140 I Q.'s studied by Terman,⁴ 12½ per cent were advanced in the grades two years; 54 per cent were advanced one year; 28 per cent were making average progress; and 5½ per cent were actually retarded one year. Of a group of forty-seven children with a median I.Q. of 145, Terman found none retarded, 8.5 per cent at the grade corresponding to their age; 29.8 per cent advanced one year; 29.8 per cent advanced two years; 19.2 per cent three years; and 12.8 per cent four years. This is substantial evidence that the children of better than average I.Q. do exceed the average rate of learning such subjects as are taught in school and that, on the whole, the higher the I.Q. the more effective the child is in learning the typical school subjects.

Intelligence and Success in High School. With regard to the limits of progress in high schools, much depends upon the standards of the school. I.Q.'s of 100 are graduated from the high schools, but in just what proportions is not known. Among first year students in Palo Alto High School, the relation between achievement and I.Q. is shown in these figures collected by Proctor and Terman:⁵

| 1 | 2 | 3 |
|---------------------|---------------------|-------------------------|
| <i>School Marks</i> | <i>Average I.Q.</i> | <i>Number of Pupils</i> |
| 50-59 | 84 | 2 |
| 60-69 | 100 | 16 |
| 70-79 | 107 | 56 |
| 80-89 | 110 | 24 |
| 90-99 | 123 | 4 |

On the whole pupils with higher I.Q.'s earn the higher grades.

Comparison of columns 2 and 3 gives an idea of the personnel of the first year class in a first-class high school. Approximately two-thirds of the group are 100 or above, half are 105 or above, and a quarter are 117 or above in I.Q. At the end of the first year, of thirteen who dropped out of school, ten were below the median I.Q. (105) and of these seven had failed in more than half of their subjects.

Intelligence and Success in College. The minimum I. Q. necessary for successful work in college is not perfectly known. The records of a sufficient number of college students are now available to show that in general the higher the I.Q. the better the achievements. It is probable that an I.Q. of at least 120 is needed to do acceptable college work in a first-class college with an average expenditure of time and energy.

Exceptionally High Intelligence. What a child of very high I.Q. can do, under favorable educational opportunities, is illustrated by a case reported by L. S. Hollingworth.⁶ E——, in 1916, was a boy eight years and four months of age, with an I.Q. of 187, and in grade eight.

In addition to this regular school work the child has covered the following special work in language and mathematics, either with a tutor or with his mother: Geometry, algebra, as far as equations, Latin, partial knowledge of the four declensions (he has been taught by the direct, informal method, and reads easy Latin), Greek — worked out the alphabet himself from an astronomical chart, between the ages of five and six years; French, equal to about two years in the ordinary school, German, ordinary conversation; Spanish, attended class with his mother, — reads and understands; Italian, reading knowledge, simple conversation; Portuguese, asked

his mother to take this language at the Columbia summer school because he could not be registered himself, Hebrew, a beginner, Anglo-Saxon, a beginning In astronomy he has worked out all the constellations from MacCready, and displays a very great interest in this subject One evening this winter he noticed a new planet near the Twins. He said it was Saturn, but his mother thought it was Mars E—— went home, worked the position out from the chart, and found it to be Saturn He has a great interest in nature, wherever found, and is already able to use Apgar intelligently. His writing is not equal to his other accomplishments He is very slow at it and for this reason dictates most of his "home work" to a stenographer. History is his chief and absorbing interest among school subjects

At the age of nine E—— had completed the work of grade nine; at eleven years and ten months, graduated from high school; and at the age of thirteen had completed three semesters of work in Columbia College. He graduated with a Phi Beta Kappa key and other scholastic honors, a few days before his fifteenth birthday. He matriculated for the Ph D. degree before he was sixteen, and received this highest academic degree in his nineteenth year. Since then he has pursued a professional career with great distinction.

In sum, there is impressive evidence that general intelligence as measured by the Binet tests and similar tests corresponds quite closely to the success of children in the conventional school program It indicates the level, difficulty, or complexity of mental functions that can be acquired, and the rate with which acquisition, within these limits, may go on.

INTELLIGENCE AND PARTICULAR SCHOOL SUBJECTS

While the results of the Binet tests indicate very well the probable achievements in schoolwork as a whole, they are not equally symptomatic of capacities in the particular subjects. The degree to which the tests indicate capacity in the several school functions is suggested by the coefficients of correlation between test scores and actual attainments. Taking as groups children in the same grades, Burt ⁷ found the following:

Correlation Between

| | |
|--|----|
| Intelligence and composition | 63 |
| Intelligence and reading | 56 |
| Intelligence and arithmetic (problems) | 55 |
| Intelligence and spelling | 52 |
| Intelligence and writing | 21 |
| Intelligence and handwork | 18 |
| Intelligence and drawing | 15 |

These correlations show that the Binet tests do not measure aptitude for all scholastic lines equally well. The tests correspond quite closely to the children's ability in the linguistic and abstract subjects — composition, reading, spelling, arithmetic. Children with high I.Q.'s are generally superior to those of lower I.Q.'s in these subjects, but they are not markedly superior in writing, handwork, and drawing, that is, in mechanical and motor abilities. It should be noted, however, that the correlations between the intelligence tests and the latter functions, though low, are nevertheless positive. In the long run, a majority of the individuals with high Binet scores will excel those with low I.Q.'s even in these functions.

On the high school level correlations between intelligence and the various academic subjects follow the same pattern. Working with a group of tenth grade children, Elden Bond³ found the following correlations with the Stanford-Binet intelligence quotient

| | |
|--|----|
| Intelligence and reading vocabulary | 79 |
| Intelligence and reading comprehension | 73 |
| Intelligence and literary acquaintance | 60 |
| Intelligence and English usage | 59 |
| Intelligence and history | 59 |
| Intelligence and biology | 54 |
| Intelligence and geometry | 48 |
| Intelligence and spelling | 46 |

INTELLIGENCE AND VOCATIONAL SUCCESS

Intelligence, as measured by the Binet tests, is closely associated with general scholastic success, especially in subjects that demand linguistic ability and the acquisition and manipulation of abstract ideas. Whether the same relation holds be-

tween intelligence and success in vocations under the more complex situations of life is a matter worthy of investigation.

TABLE XI

THE MINIMUM INTELLIGENCE QUOTIENT OF WOMEN OVER 16 YEARS OF AGE REQUIRED TO DO VARIOUS JOBS IN AN INSTITUTION FOR THE FEEBLEMINDED *

| <i>Approximate Minimum I Q</i> | <i>Time or Number of Trials to Learn</i> | <i>Task or Vocation</i> |
|------------------------------------|--|---|
| 10-20 | 15 trials | Fetch and carry a single object, <i>e g</i> , chair |
| | 1 day | Pick up stones, trash, etc , from lawn or walk |
| | 3 days | Pull up <i>one kind</i> of weed from garden |
| 20-25 | 6-8 days | Scrub floors or dust |
| | 16 trials | Carry out standardized simple errand |
| | 3 days | Pick <i>one kind</i> of fruit or vegetable |
| | 5 days | Pick <i>two kinds</i> of fruit or vegetable |
| | 8 days | Saw wood |
| | 5 days | Plant <i>one kind</i> of vegetable |
| 26-30 | 5 days | Sort and hang up clothes |
| | 7 days | Do simple hand washing |
| | 11 days | Do general cleaning |
| | 18 trials | Do dishwashing |
| 31-37 | 18 days | Tend chickens |
| | 8 days | Wash clothes by hand |
| | 6 days | Pare and wash potatoes, etc. |
| | 19 trials | Darn stockings, do simple crocheting |
| | 18 days | Milk cow |
| | 17 days | Do hand ironing |
| 38-44 | 52 trials | Make beds |
| | 14 days | Do sheepherding |
| | 34 days | Do simple cooking |
| | 29 trials | Do simple hand sewing and mending |
| | 25 trials | Wait on table |
| 45-55 | 19 days | Help around farm |
| | 29 trials | Do shampooing |
| | 113 days | Do simple dressmaking |
| | 9 days | Embroider |
| | 65 days | Paint barns, etc |
| | 89 days | Do simple carpentry |
| 60-70 | 19 days | Plow |
| | 25 days | Do general farmwork |
| 77 | 11 days | Do general housework |

* From M. Vanuxem, *Education of Feeble-minded Women* ⁹

A careful study (by Vanuxem)¹⁰ of women sixteen or more years old in an institution for the feeble-minded shows clearly that in the lower levels there is a close relation between Stanford-Binet I Q's and the complexity of vocational tasks which can be learned. (See Table XI) In this study, attempts to teach women different tasks were made and the approximate minimum I Q required to learn to do each task satisfactorily was determined. The minimum I.Q.'s for each of various jobs and the average time required to teach the women are given in the accompanying table. A survey of this table shows that the more complex the job, the higher the I Q needed to learn it. For example, while women of I.Q.'s less than 25 can do certain simple tasks, they are unable to cook, make beds, or wait on table, which require shifting from one to another of several different — even if simple — activities.

After the entrance of the United States into the first World War in 1917, the Army Alpha, an intelligence test especially devised for male adults, was applied to many men who were previously following some definite occupation. This yielded interesting data on the relationship of intelligence and occupational status. The average scores on the Army Alpha Test obtained by various occupational groups are shown in the following table. In interpreting these figures, it should be realized that the groups overlap greatly even when there is a difference of ten or even twenty points between the averages.¹¹

| <i>Scores</i> | <i>Occupations</i> |
|---------------|--|
| 40 to 49 | Farmer, laborer, general miner, and teamster |
| 50 to 58 | Hostler, horseshoer, tailor, barber, general carpenter, painter, truck chauffeur, baker, cook, concrete or cement worker, mine drill runner, bricklayer, cobbler |
| 60 to 69 | General machinist, lathe hand, general blacksmith, brakeman, locomotive fireman, auto chauffeur, telegraph and telephone lineman, butcher, bridge carpenter, railroad conductor, railroad shop mechanic, locomotive engineer, laundryman, plumber, auto repairman, pipe fitter, auto-engine mechanic, tool and gauge maker, stock checker, detective and policeman, tool-room expert, gunsmith, marine engineman, hand riveter, telephone operator |

| <i>Scores</i> | <i>Occupations</i> |
|---------------|--|
| 70 to 79 | Truckmaster, farrier and veterinarian, receiving clerk, shipping clerk, stockkeeper |
| 80 to 89 | General electrician, telegrapher, band musician, concrete construction foreman, photographer |
| 90 to 99 | Railroad clerk, general clerk, filing clerk |
| 100 to 109 | Bookkeeper, army nurse, mechanical engineer |
| 100 to 119 | Mechanical draughtsman, accountant, civil engineer, Y.M.C A. secretaries, medical officers |
| Over 120 | Army chaplains, engineering officers |

When comparisons of radically different vocations are made, there is at once perceptible a tendency for vocations that require facility in dealing with words and symbols to stand higher than those that require aptitude for manipulating things and mechanisms. The clerical workers in general excel those engaged in mechanical occupations. The tests appear to have a verbal and linguistic bias; to favor those skilled in handling words and symbolic concepts as contrasted with those proficient in motor and mechanical abilities. This tendency appears both in the results of measurements of vocational groups and in the results of comparisons of attainments in school subjects.

Further examination of the data, however, will disclose the fact that the intelligence test measures abilities which possess a wider significance. Making comparison within a similar type of occupation, the more skilled workers appear to stand higher on the intelligence scale than the less expert. The mechanical engineer and draughtsman are above Alpha score 110, the general electricians and construction foreman score about 85, the workers on more specific tasks, such as automobile repairman, plumber, toolmaker, bridge carpenter, auto chauffeur, etc., are below 70, while the unskilled laborers are at the bottom of the list. Among the several types of clerical workers, a similar correlation between intelligence and occupational levels exists. The chaplains excel the Y.M.C.A. secretaries, the accountants surpass the bookkeepers, the medical officers are superior to the army nurses. Thus, within similar occupational lines, intelligence as measured by this

test is associated with levels of proficiency. This result is probably due to the fact that the better the position the greater the need for ability to deal with abstract facts.

It is significant that the members of the professional classes nearly always rank high in intelligence tests. For example, the median Army Alpha scores of 5950 students in Ohio State University in the Liberal Arts College and in the various professional schools (law, medicine, etc.) were all well above all the army occupational groups except the professional classes. The median for the medical and law students, for example, was 142.¹²

INTELLIGENCE AND SOCIAL ADAPTABILITY AND LEADERSHIP

The use of the tests in the army provided material that suggests a fair correspondence between fitness for managing and leading men and intelligence ratings. The students of the Officers' Training Schools who succeeded in earning commissions were on the average of higher intelligence, according to the tests, than those who failed. Among noncommissioned recruits in the cantonments, fitness for advancement as judged by officers corresponded fairly closely with intelligence scores. Finally, the average intelligence of seasoned troops corresponded fairly closely with military rank. In one group, which included approximately 30,000 men, the privates obtained an average Alpha score of approximately 73, corporals 95, sergeants 107, and commissioned officers 139. The overlapping of the intelligence scores of one rank upon others was great, however.¹³

Many studies have been made to ascertain the correspondence of intelligence and social adaptability, leadership, popularity, etc., in children. These results show much the same general relations as those obtained on adults in the army. All lead to the conclusion that intelligence indicates in some degree, but by no means perfectly, the capacities required in understanding, getting on with, and managing other human beings.

There is some evidence, however, that the typical social leader is a person brighter than the average of this group but not the very brightest. The person with an I Q between 110 and 130 is bright enough to do better than the person of average I.Q. and yet not so far away from the average people as to be extremely different from them in intellectual abilities and interests¹⁴ If you glance at the surface of distribution (Fig. 10) you will see that the majority of children lie near the average. A person of 110-130 I.Q. is not so far above the average as to be of vastly different interests and ability from the average; a person of 180 I Q is very distant from average and duller people — so distant as to be of decidedly different abilities and interests. A person, especially a young one, so far out of touch with the general population of his age is more likely, other traits being equal, to be not so well understood and not so highly favored. The favorite is often a person of less intellectual endowment who is "more like the bunch." This does not mean that extremely bright children are conceited. They are rarely conceited but often puzzled as to why they differ as they do from the majority.

INTELLIGENCE AND MORAL ADJUSTMENTS

Fine gradations of moral adjustments are difficult to obtain. We may seek for some evidence in the studies of the relation of intelligence to delinquency and crime. Of the many individual studies, one made by Burt¹⁵ will be considered, first, because it is based upon children, who can be more adequately measured than adults, second, because it is probably fairly typical, and third, because of the care with which both intelligence and other abilities were measured. The group comprises 107 juvenile delinquents, ages six to fifteen, whose misdemeanors include theft, begging, truancy, assault, sexual offenses, damage to property, and general incorrigibility. The average chronological age of the entire group was 13.2 years, the average mental age 11.3, thus giving an average retardation of two years in mental age or an average I Q. of

85.6. Analyzing the distribution further, it is found that 7 per cent might be classified as "feeble-minded"; 20 per cent as very dull; 44 per cent as less dull but below average, 27 per cent as about average; and only 2 per cent as above average. Other studies of delinquents, however, have shown somewhat larger proportions of "above average" intelligence. Supernormal intelligence among children is not incompatible with delinquency, indeed, as will be pointed out later, pupils with very high I.Q.'s (above 150) have special difficulties in making adequate social adjustments. The proportion of feeble-mindedness in the delinquent group is, however, much greater than the proportion of feeble-mindedness in the total population. The most significant fact, probably, is that although the delinquent group, as a whole, is a somewhat dull group, delinquency occurs among children and adults of all intellectual levels.

In Burt's study, the educational attainments of the delinquent children were appraised by objective tests with most significant results. The retardation in school attainments is twice as great as the retardation in mentality; namely, the equivalent of nearly four years. A similar finding was secured in America by Bond and Fendrick.¹⁶ Burt found that the educational achievements of a group of delinquent children with an average age of 13.2 years was equal to the normal attainments of average children of 9.5 years. Not a child was above the average of his life age in school attainments; only five per cent were approximately equal to it; a fifth were slightly below, and three-quarters were retarded by 30 per cent or more. This suggests that marked difficulties and frustration in schoolwork tend to be associated with delinquency. It is now rather widely agreed that failure to make a satisfactory adjustment in school or elsewhere may (in some instances) result in delinquency or other forms of maladjustment.

Since dull children have less aptitude for schoolwork than bright children, they are more likely to find less satisfaction

and more frustration in school and therefore are more likely to rebel and try to find a compensating satisfaction in activities that are classed as delinquent. The very bright children are sometimes frustrated by being forced to spend their time in activities that are far below their level of ability and interest. Thus, frustration from any source may result in maladjustment and misconduct, as will be pointed out in later chapters in which other factors will be considered.

CONCLUSIONS

The intelligence tests do not measure equally well all types of capacity to learn, but those which are reflected to a considerable degree are of great importance. Upon such capacities mainly depend achievement in school and colleges and success in many vocations. Social adaptability, proficiency in managing people, and effectiveness of social adjustments are also associated to a small degree with this type of intelligence. The association of intelligence and ability to acquire various mechanical and motor skills, — writing, drawing, painting, athletics, and various mechanical trades — is positive but low.

The fact that the I Q. is not, in an individual case, absolutely constant from year to year, that it is not possible to give a test once and “fix” the level of intelligence for life, and the further fact that intelligence does not enter equally into all kinds of activities and vocations, must be taken into account in practical uses of intelligence tests in schools and elsewhere. The latter fact indicates, moreover, that abilities not fully measured by an intelligence test play an important role in school and society. Before giving more definite recommendations for the use of intelligence tests, we must canvass the facts concerning other abilities and disabilities.

SPECIAL ABILITIES AND DISABILITIES

The fact that the correlations of intelligence tests with motor and mechanical abilities, artistic and musical talents, and other aptitudes are not high and that such abilities depend,

a great extent, upon other capacities has led to many investigations designed to develop tests of various special aptitudes and inaptitudes. Some of these will be briefly characterized. Progress has been made in developing aptitude tests for achievement in the fields of music, mechanical arts and trades, fine arts, physical arts such as athletic sports, manual dexterity, clerical work, teaching, nursing, medicine, and law. The most extensive work has been done in developing tests for aptitude in music and the mechanical fields. A brief description of these tests will give an idea of the nature of aptitude tests.

Seashore's Tests of Musical Aptitude or Talent. During his long professional career, C. E. Seashore and his students conducted extensive research to determine the basic abilities and capacities involved in the creation (especially singing and playing instruments) and the critical appreciation of music. His work was paralleled by the construction and try-out of tests for "musical talent," as Seashore called it. The tests have been revised from time to time as further information came to light. During the course of his work Seashore explored such abilities as those included in the incomplete list below.¹⁷

- I. Tests of musical sensitivity
 - A Simple forms of impression
 - 1 Sense of pitch
 - 2. Sense of intensity
 - 3 Sense of time
 - 4 Sense of extensity
 - B Complex forms of appreciation
 - 1 Sense of rhythm
 - 2 Sense of timbre
 - 3 Sense of consonance
 - 4 Sense of volume
- II Tests of native capacity for acquiring skill in motor production of tones, vocal, instrumental, or both
 - 1 Control of pitch
 - 2 Control of intensity
 - 3 Control of time

4. Control of rhythm
 5. Control of timbre
 6. Control of volume
- III. Tests of musical memory and imagination
1. Auditory imagery
 2. Motor imagery
 3. Creative imagination
 4. Memory span
 5. Learning ability
- IV. Tests of musical intellect
1. Musical free association
 2. Musical power of reflection
- V. Tests of musical feeling
1. Musical taste
 2. Emotional reaction to music
 3. Emotional self-expression in music

Since all of these abilities are involved in music, it follows that aptitude for music is not to be conceived as a single and simple capacity. On the contrary, it is an organization of many. Excellence in one, coupled with deficiencies in others, would not suffice for achievement. Some single deficiencies such as the capacity to discriminate pitch within certain limits — a capacity that it is difficult to improve — would, on the other hand, make progress in certain phases of musical ability impossible however optimum the capacities in other respects. The apt individual is the one who approaches an optimum degree of ability in all. A final appraisal of musical aptitude would consequently be based on a consideration of many component abilities, each weighted in accordance with its importance in relation to others.

The purpose of the Seashore Musical Talents Tests is to determine the degree of aptitude an individual may have and thus estimate the degree of achievement which education and training are likely to produce. These tests, in other words, provide a prediction or prognosis of success and should be useful for educational guidance. Figure 11 gives a "profile" of an individual and Seashore's own interpretation of it. Originally the Seashore tests required a number of complex

pieces of apparatus, but the most important tests may now be given using a few specially prepared phonograph records. Two series have been prepared, each requiring three Victor records. One is for persons who have received considerable

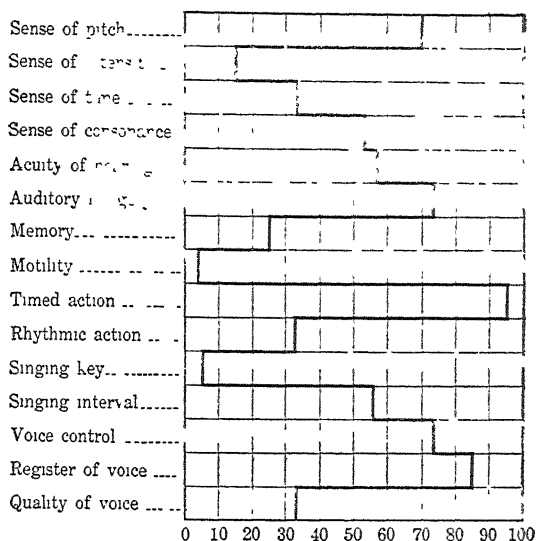


FIG 11 A GRAPHIC REPRESENTATION OF THE ABILITIES OF MR GRAY IN THE SEASHORE TESTS OF MUSICAL TALENT

Scores range from 0 to 100 as shown by the figures in the bottom line. The tests are designated by titles on the left. Professor Seashore's summary of this case is as follows: "Mr. Gray has a fairly good sense of pitch, very poor sense of intensity, and poor sense of time. His sense of consonance is below average. His acuity of hearing is exceedingly fine." He has good tonal imagery, but decidedly inferior tonal memory and general motility. Seashore continues, "... his timed action is good, but his rhythmic action is poor. He sings in fairly true pitch and reproduces intervals fairly well. He has a very wide register of voice but poor quality. In general, Mr. Gray is a fair type of what is popularly called 'average' musical ability, that is, he ranks high in some talents and low in others. He has had little musical education, but possesses a decidedly artistic type of mind and lives much in musical feeling and vital artistic appreciation."¹⁸ (From C. E. Seashore's *The Psychology of Musical Talent*, Silver, Burdett & Company, 1919, by permission.)

training in music and one for the untrained school pupil or adult. Each series consists of six tests as follows: pitch, loudness, time, timbre, rhythm, tonal memory.

Although a generation of brilliant work has been devoted to

the development of these tests, the predictions given by them are still less than perfect in individual cases. They seem to be more successful in identifying persons whose musical talent is limited than in discriminating among those who are above average. They will distinguish fairly well the top from the bottom third in promise but they are much less successful in revealing which of the top third are likely to be the very best five in a hundred after training. This is due in part to the fact that other abilities than those involved in musical talent, strictly speaking, contribute to final efficiency. General intelligence is apparently one factor. Personality traits, enthusiasm, diligence, and many other factors influence achievement in music as in all other lines.

Tests for Mechanical Aptitude. Several tests have been developed for measuring aptitude for constructive and manipulative activities in dealing with tools, apparatus, machines, and materials in the numberless mechanical arts, crafts, and industries. Among the better known tests are the Stenquist Mechanical Aptitude Tests, the MacQuarrie Test of Mechanical Ability, the Detroit Mechanical Aptitude Examination, the O'Rourke Mechanical Aptitude Test, and the Minnesota Mechanical Ability Tests. The Minnesota Tests¹⁹ consist of:

1. Paper form-board tests, which measure ability to discriminate various designs and figures
2. Spatial relations test
3. Assembly test
4. Interest analysis test
5. Packing blocks test
6. Card sorting test

The tests of mechanical aptitude, like other aptitude tests, give at least rough indications of the degree of talent an individual has. They are, like other aptitude tests, to be considered not as a final or sole criterion of promise even in the mechanical arts. The modern practice is to consider the results of such tests along with other data about the individual

such as his intelligence and other test scores and evidence concerning his personal, social, dynamic, and other traits.

Tests for Artistic Aptitude. For talent for discriminative activities in painting, drawing, modeling, architecture, dress-making, interior and exterior decorating, etc., several tests have been suggested. Of these probably the best known are the McAdory Art Test and the Meier-Seashore Art Judgment Test. The latter test consists of 125 pairs of samples of art work, one member of each pair selected from the work of a master. Artistic insight is shown by the success of the subject in selecting the best sample in each group. This test, and the McAdory also, measures ability to distinguish merit in art products, an important, perhaps indispensable, ability, but certainly not the only one needed in artistic achievement. Tests of other aspects of artistic talent are being developed, but as yet a highly satisfactory program of measuring artistic capacity in general has not been developed.

Tests for Physical Capacities. Various tests for physical capacities, which perhaps function in most pure form in athletics, gymnastics, and sports, but which enter into other skills that require skillful management of bodily action, have been developed. The Rogers Physical Capacity Tests and the Brace Motor Ability Tests are examples of tests of locomotor capacities. The Rogers test ²⁰ gives a strength index based on such measures as lung capacity, strength of grip, strength of back, and an athletic index based on the 100-yard dash, the broad jump, the high jump, the shot put, and skill in baseball, football, and basketball throws. The Brace test consists of twenty tests of body balance. Such batteries have proved useful in gauging general all-around athletic competence and in classifying students into groups of similar aptitudes for competitive games and sports.

Tests for Social Capacities. For measuring social capacities, essential to understanding and influencing other people as in the work of the teacher, minister, salesman, military officer, physician, politician, lawyer, industrial manager, and

so on, many tests have been developed with, but none is as yet very comprehensive or outstanding.

Other Aptitude Tests. At the present time, there is much activity in developing aptitude tests in various areas. Progress has been made in constructing tests of aptitude for certain professional fields. The following titles suggest some of the important achievements:

- Minnesota Vocational Test for Clerical Workers (Andrew)
- Aptitude Test for Nursing (Moss and Hunt)
- Scholastic Aptitude Test for Medical Students (Moss)
- Law Aptitude Examination (Ferson and Stoddard)
- Prognosis Test of Teaching Ability (Coxe and Orleans)
- Stanford Scientific Aptitude Test (Zyve)

Most of these tests are designed to measure the information which seems to be necessary background for achievement in the field, together with the student's aptitude in those skills which are deemed particularly important.

The Coxe-Orleans Prognosis Test of Teaching Ability,²¹ for example, is designed to assist in the prediction of a student's probable success in teaching by a measure of his knowledge of teaching methods and practices, his general information, and his ability to master professional material in the educational field. The test is composed of five subtests giving scores on general information, knowledge of teaching methods and practices, the ability to learn the type of material included in professional books used in teacher training courses, the ability to understand educational reading matter, and the ability to study and work out educational problems. The first two are tested by short answer, multiple-choice, and true-false questions, the last three by presenting the student with paragraphs which are brief lessons, theoretical discussions, or educational problems on which a number of questions are asked.

Although the correlations between this test, which measures a number of seemingly important skills, and a comprehensive achievement test in normal school work given at the end of the first year range from .534 to .839, the authors advise add-

ing to it the scores from a group intelligence test and if possible scores from standardized achievement tests in high school English and perhaps in several other high school subjects. The authors claim that it is possible to secure a multiple correlation as high as .90 when such a combination is used. This combination appears to be fairly reliable for the prediction of individual success.

PROGNOSIS TESTS

The tests of aptitude for music, teaching ability, etc., are designed to measure status at the time of the test and to predict the probable success to be achieved during further training or during a professional career, as in teaching, or both. They are, then, used to estimate aptitude and to prognosticate further achievement. The two purposes are, of course, essentially the same. They may therefore be called aptitude, talent, capacity, or prognosis tests. The choice of the descriptive term is rather arbitrary.

A number of tests have been devised to predict ability to learn certain school subjects. These tests are usually called prognosis tests. They do not, however, differ in any essential way from the tests for musical "talent" or mechanical "aptitude." The following are examples:

Orleans Algebra Prognosis Test

Orleans Geometry Prognosis Test

Symonds Foreign Language Prognosis Test

Luria-Orleans Modern Language Prognosis Test

Iowa Placements Examinations (Chemistry, English, Mathematics, Modern Language, and Physics)

The Orleans Algebra Prognosis Test,²² which is one of the best known of the prognosis tests, is made up of twelve subtests. The first is a test of arithmetic fundamentals. The next ten teach short lessons covering the topics usually taught in beginning algebra, namely: Substitution in monomials, use of exponents, meaning of exponents, substitution in monomials with exponents, representation of relations, representation of

expressions, positive and negative numbers, problems, and addition of like terms. Each lesson is followed by a brief test in which the pupil must apply what he has learned. The twelfth test is a summary test covering all the test lessons. Correlations from .50 to .80 were found when this test was correlated with the Columbia Research Bureau Algebra Test I.

The value of a prognosis test lies partly in its ability to predict success in a school subject more reliably than an intelligence test, or to give a much higher prediction if combined with an intelligence test. In a recent study²³ the multiple correlation of the Algebra Prognosis Test with the mid-term and final examinations in algebra was found to be .57. The Terman Group Intelligence Test correlated .52 with the same measures. When the two tests were used together the correlation with the mid-term and final examinations combined was .64. When a test of reading explanatory passages in algebra was combined with the Algebra Prognosis Test the correlation with the mid-term and the final examination as a combined measure of ability in algebra was raised to .69. In other words, the prognosis test, especially when combined with other measures of ability, is valuable in supplying for the teacher a more accurate estimate of the level at which the students may be expected to work than will an intelligence test alone.

Readiness Tests. A recent development in testing of the prognosis type is the readiness test which is designed to give a measure of the child's preparation for learning a subject with success. These tests are usually thought of as belonging to the first grade, but the concept can be extended to mean readiness to learn at any new level. A set of readiness tests in arithmetic is now being validated which tests not only the necessary skills for beginning arithmetic, but also the background skills needed for beginning each new topic found in a standard curriculum through the sixth grade. The most extensive work has been done on tests of "Reading Readiness." In a general

way, the reading readiness test is similar to other "aptitude," "talent," or "prognosis" tests, but in certain respects it perhaps illustrates best of all the most recent point of view in testing.

Reading readiness testing has grown out of extensive investigations of the factors involved in learning to read. Its purpose is to include as many of these factors as is practical in an objective, standardized battery of tests. Like other prognosis tests, it is designed, furthermore, to have diagnostic value, that is, value in revealing to the teacher each pupil's strength or weakness in each factor so that her teaching may take them into account. Indeed, the diagnostic and predictive clues may be used to determine not only how "ready" the pupil is to begin to learn to read but also to reveal to the teacher the important steps to take for all pupils from the most "ready" to those as yet quite insufficiently "ready" to start lessons in actual reading.

The Gates Reading Readiness Tests,²⁴ which are given to children shortly after they enter the first grade, will serve as an example. It consists of five tests as follows:

1 *Picture-Directions Test* This test consists of giving the pupils orally a series of directions to carry out by marking objects in a picture. It measures ability to interpret pictures and to attend to and follow directions, and to recognize in pictures objects common in the child's experience.

2 *Word Matching Test* This test measures familiarity with printed word forms at a rudimentary level.

3. *Word Card Perception Test.* This test measures ability to recognize in small type on a page words exposed for five seconds in large type on a card.

4 *Rhyming Test* This test measures the child's ability to distinguish the component sounds in words—an ability involved in learning "phonics."

5. *Letter and Number Reading Test* This is a measure of ability to read the letters of the alphabet and the numbers below 10.

A score is obtained for each test as well as a total score for the test as a whole. The correlations of the total score obtained at the beginning of the year with reading ability measured at

mid-year are about .71. The correlation of the Pintner Cunningham Mental Age from a test given at the beginning of the year and reading ability at mid-year are about .44. The reading readiness test gives a clearly better prediction of success in learning to read during the term. The readiness test is more useful, furthermore, since the scores of the several tests tell the teacher in what abilities, necessary for learning to read, the pupil is strong, average, or weak. If his score is relatively low in Picture-Directions, special attention should be given to developing ability to interpret pictures and to listen to and carry out instructions. In this way the weak spots in the pupil's equipment may be strengthened sufficiently to ensure success in learning to read. The intelligence test, as observed earlier, however, is correlated with ability to learn to read and it has a value for predicting other forms of first grade achievement. When it is given, the M.A. may be combined with the reading readiness total score. The correlation then becomes about .76 which is higher than that given by the reading readiness test alone. The M.A. and I.Q., moreover, have certain values for understanding the pupils which the readiness tests do not have.

The studies for predicting reading by means of readiness tests and intelligence tests singly and combined reveal important facts about the use of both types of test. The intelligence test predicts school progress, in general, very well but achievement in particular subjects like reading less accurately than is desirable. It gives a good indication of general capacity but not specific information about particular strengths and weaknesses of great importance in teaching a particular subject. The more analytic tests, like the reading readiness tests, tests for musical talent, or tests of prognosis of algebra, give the teacher a better idea of what can and should be done and what cannot be done by teaching. For example, it is known that the abilities measured by the Picture-Directions Test in the reading readiness series can be developed by instruction within certain limits, whereas the ability measured by the

Pitch Test of the Seashore Musical Talent Tests is usually subject to very little improvement through special practice. Such information enables the teacher to direct her efforts most fruitfully, neither neglecting instruction where it would bring results nor wasting time where training would be futile.

The full sizing-up of the children's readiness for reading is not limited to such readiness tests as the one mentioned above and the intelligence test. Although these two tests taken together give a very high correlation with reading progress, other influences enter in to make the correlation less than perfect. Among them are physical factors such as health and vigor, sensory factors such as acuity of vision and hearing, social factors such as feelings of security and satisfaction in the new classroom situation, emotional factors such as nervous tension when studying or fear of making mistakes, and many others such as speech habits, interest in stories, and the effects of the attitudes of parents toward reading. The teacher can use many forms of information beyond the very valuable insight given by the intelligence and aptitude, prognosis, or readiness tests. Indeed, her purpose should be to achieve as full an understanding as she can of the very complex make-up of each child. The tests discussed in this chapter are not substitutes for such insight but means of achieving it in part.

SUMMARY

This chapter has been concerned with the nature and measurement of intelligence and special aptitude. Following are the main points of particular significance to the educator, which have been discussed thus far:

1. Intelligence, as measured by intelligence tests, is closely associated with scholastic success, somewhat less closely associated with success in different vocations, and still less with social adaptability, ability to work with people, effective moral adjustments, and achievement in music, art, and mechanical arts.

2. Special aptitudes for music, art, or mechanical proficiencies are not measured by intelligence tests and specific tests have been developed to measure them. In music and art, particularly, the tests that have been developed up to the present time have proved more useful in eliminating those with no ability than in selecting those with the highest ability.

3. Scholastic success, while dependent upon intelligence, is composed of other factors as well, and special prognosis tests have been standardized to give more accurate predictions of a student's probable success. One of the most important types of prognosis test is the readiness test which helps the teacher to discover when a child is ready to learn, and at the same time provides diagnostic evidence of areas in which the child should be given more training.

USES OF INTELLIGENCE TESTS AND APTITUDE TESTS

The discussions in the preceding sections have made it clear that intelligence tests do not measure all of a person's ability. They do, however, give an estimate of one very important aspect of it which is definitely related to academic success and in less degrees to achievement in most other fields. For this reason intelligence tests have become valuable instruments in education. The detailed uses of intelligence tests will vary from situation to situation, and it is therefore inadvisable to attempt to present them in this book. Certain general purposes underlying the use of intelligence tests are common, however, to almost all school situations and will be considered at this time. In discussing the practical uses of intelligence and aptitude tests it will be advisable to review certain facts previously presented in this and the preceding chapter — which will probably do no harm!

Use of the Intelligence Test for Determining the Optimum Level of Work. A primary aim of education is to assist each child to make the best possible use of all his capacities. Although a readiness test or a prognosis test may give a better prediction of success in one particular area, such as reading

or algebra, the number of such tests is limited and their value is confined to the specific subjects which they are designed to test. The intelligence test is the best *general* measure of a pupil's capacity to succeed in his schoolwork. The mental age gives the teacher an estimate of the mental level at which a child can be expected to work most efficiently in academic subjects except those like music, art, and manual activities which seem to depend upon highly specific *aptitudes*. The value of the intelligence test score for determining the optimum level of study depends upon the recency of the test, since, as has already been shown, the I.Q. tends to vary in certain cases from time to time. If the I.Q. does vary significantly on a retest this fact in itself is of importance to the teacher. A sharp rise in I.Q. may be the result of better adjustment to school, of freedom from emotional tension, or of numerous other favorable changes. A sharp drop in I.Q. may be the result of illness, or of recently developed emotional tensions, or of other causes which may be discovered and alleviated.

Use of the Intelligence Test in Diagnosing Disabilities in School Subjects. In the past the tendency has been to consider academic ability and intellectual ability so closely related that the ratio of the first to the second could be used as an "accomplishment quotient" * similar to the intelligence quotient. Recent studies have shown that the relationship is not exact enough to justify strict use of the accomplishment quotient technique. The present tendency is to compare the score representing achievement in a school subject and the mental age in a more informal and flexible way. The degree of deviation between the two scores necessary before it is considered serious enough to warrant remedial help will vary

* This may be computed by dividing the "educational" or achievement age by the mental age. Thus if scores on tests of school subjects are converted into age scores, the average of the latter may be computed to give an average educational or achievement age. If the educational age is 12 years and the mental age 10, dividing the former by the latter gives an accomplishment quotient of 120. If both are 10 years, the accomplishment quotient is 100, if the educational age is only 8 years, and the mental age 10, the accomplishment quotient will be 80.

from subject to subject and from grade to grade. For example, in the primary grades a "reading age" which is over six months below the mental age may be a serious retardation in certain classes whereas in grades four and five the retardation can be as great as a year before it becomes a handicap, and above grade six a retardation of as much as a year and a half or two years may not be very serious.

Use of the Intelligence Test in Grouping Pupils for Schoolwork. The mental age gives an indication of the mental level at which a student may be expected to comprehend his work and learn efficiently in general. The same mental age, however, may be shown by pupils quite different in chronological age. For example, the M.A. of 12 years may be secured by a child who is chronologically 12 years of age, or by one who is 16, or by one who is 8. The first child has an I.Q. of 100 and may be expected to learn with average quickness, the second has an I.Q. of 75 and will probably grasp what is taught much more slowly, and the third, whose I.Q. is 150, will probably comprehend and learn much faster than either of the others. It can be seen, consequently, that the I.Q. is a rough index of the probable learning rates of the various members of the class. With this information at hand the teacher can adjust her methods to meet the needs of various members of her class.

Many schools have used the chronological age and the I.Q. as a basis for selecting classes within a grade. A practical disadvantage of homogeneous or ability grouping, as this system is called, can readily be understood when one realizes that most of the correlation coefficients of intelligence tests with single academic subjects range from .40 to .60. This means that estimates of ability in any particular school subject based on intelligence alone will be far from perfect in a large proportion of the children. Since the correlation of the typical academic subject with any other subject is no higher than the correlation of the typical subject with intelligence, the child who is above average in arithmetic will not necessarily be

above average in reading, history, or in any other school subject. The result is that classes grouped carefully according to intelligence show great variation of ability in the various school subjects. "Ability groups" formed on the basis of intelligence tests, moreover, will be even more heterogeneous in physical, mechanical, musical, and social interests and abilities as indicated by the fact that the correlations of intelligence with abilities in these areas are very low.

In many schools homogeneous grouping is giving way to more careful and extensive study of individual children and less formal grouping within the classroom for different purposes. The teacher uses the intelligence test together with all the other information she has about the child to place him with others of his ability in smaller groups, the composition of which will vary from subject to subject and from time to time.

Identification of Intellectual Deviates. In any classroom the child who is very bright and the one who is very dull are likely to be particularly difficult problems. The teacher's task is difficult enough when the pupils in her class vary but slightly from average competence. In the early sections of this chapter the great difference between children with I.Q.'s below 80 and those above 120 was illustrated. Often children at these extremes learn to compensate for, or to disguise, their ability or lack of it in such a way that the teacher is not aware of the intellectual level with which she has to deal. This may result in attempts to force a dull child to work that is well beyond his intellectual ability, and in failure to assist the gifted child to make use of his exceptionally great capacity.

There is as yet no agreement on the value of segregating the children at each end of the intellectual scale into "special" or "opportunity" classes in order that they may work with others of similar high or low ability. Whatever the final decision on this question may be, it is fairly certain that these extreme cases should be discovered, and the teacher given as much assistance as possible in working with them. Especially is this true of the gifted child. The very dull child is likely to be

recognized since sooner or later he will reach a place in his work where he will experience great difficulty. The very gifted child may slip through elementary school, high school, and even college without ever having been recognized as exceptional and without ever having been taught how to make full use of his rare power. One of the most important problems facing educators today is that of identifying and cultivating the potential capacity for leadership which most children of high I Q's really have.

Use of Intelligence Tests in Vocational and Educational Guidance. The fact that intelligence is positively related to vocational competence and to attainments in college work has definite practical implications. The educational or vocational counsellor can use the score on the intelligence test along with other data to predict a pupil's success in college or in many vocations. For predicting either scholastic success in future schoolwork or vocational success thereafter, many factors as well as intelligence must be taken into account. Vocational success depends not only on intelligence, but also upon health, physical strength, ability to work with people, interest, personality characteristics, and specific aptitudes, such as those discussed earlier in this chapter. Success in college depends in part upon such factors as persistent effort, choice of appropriate courses, ability to adjust to college life, and to some extent on the intellectual level of the other students who are attracted to that particular institution. An additional source of error lies in the fact that the I Q. does not always remain the same, and the score which the counsellor has at hand, especially if it is based on a test given some time earlier, may suggest an overly optimistic or pessimistic estimate of the student's ability. The intelligence test provides, therefore, only one part of the information which the counsellor should use when advising a student about his future.

Use of the Intelligence Test to Estimate the Range of Abilities in a Class. The preceding discussion has been concerned with the adjustment of the individual pupil. The

intelligence test can be used to secure useful information about whole classes, grades, and schools. If intelligence test scores are available for all the children in a class, the teacher can note the range of ability with which she must deal. In some classes this may be small, and the group may contain no very bright or very dull pupils. In others the range may be very wide, and the group may contain both very gifted and very dull children. A teacher who has the latter group must make allowance not only for differences in information in the various subjects but also for great differences in learning rates. The accompanying table, showing the distribution of mental ages for grades three to eight, for example, displays this fact. Grade six, for example, has two children with an M.A. of 10 years. There are children of this same M.A. as low as grade three; it has two M.A.'s as high as 14, or higher than a number of children in grade eight. Thus although the average mental age increases from grade to grade, each grade really contains the mental ages of several grades. This gives the teacher a difficult task in adjusting assignments, methods of instruction,

TABLE XII

DISTRIBUTION OF MENTAL AGES OF 220 CHILDREN BY GRADES¹

| Mental Age | Grade | | | | | |
|------------|-------|-----|------|------|------|------|
| | 3 | 4 | 5 | 6 | 7 | 8 |
| 16 | | | | | | 2 |
| 15 | | | | | 4 | 12 |
| 14 | | | | 2 | 13 | 17 |
| 13 | | | | 10 | 12 | 5 |
| 12 | | | 5 | 21 | 5 | |
| 11 | | 9 | 22 | 10 | 2 | |
| 10 | 8 | 23 | 11 | 2 | | |
| 9 | 37 | 15 | 1 | | | |
| 8 | 19 | 1 | | | | |
| 7 | 2 | | | | | |
| Average | 8.8 | 9.8 | 10.8 | 12.0 | 13.3 | 14.3 |

* From L. M. King, *Learning and Applying Spelling Rules in Grades Three to Eight*²⁵

levels of performance (to mention only a few of the problems) to meet the needs of all pupils. Since it is frequently found that a teacher often cannot correctly determine the intellectual range within her class on the basis of school attainments alone, the intelligence test is an indispensable means of securing valid information concerning the intellectual constitution of her group and of discovering the needs of individual pupils.

Use of Intelligence Tests in Determining the Level of Ability in a Class or School. Even in cities in which homogeneous or "ability" grouping is employed, classes of the same grade may differ greatly. While caution is required in predicting the ability of any individual child from an intelligence test score, group predictions are much more reliable. If teaching is approximately the same, the average achievement of a class will tend to vary with its average intellectual ability. The use of the average mental age of the class as an approximate standard against which the achievement of the group may be compared is fairly reliable. If the abilities of different teachers are to be appraised in terms of the average attainments of their respective classes, the average mental ages and intelligence quotients of the several classes should be determined. It would be obviously unfair to expect a teacher with the class of lowest average intelligence to produce as high abilities among her pupils as the teacher whose class has the highest average intelligence.

Average intellectual ability may also vary from school to school. Schools situated in districts of low socio-economic status are likely to have a school population of less than average mental ability. Those drawing children mainly from professional groups will, as a rule, have better than average mental ability. Comparisons of different schools will be fairer and more meaningful if they take into account the intellectual capacity of the children in them.

Measurement of Special Abilities. The intelligence test, we observed, does not give a satisfactory prediction of ability to achieve in music, art, and various mechanical and social

lines. Hence, there has been much activity in developing aptitude tests for these important types of achievement. Up to the present time, however, the development of these tests has not reached a point where the very gifted in these special abilities can be distinguished from moderately gifted with any degree of certainty. Available tests do, however, serve as a rough screen to identify those who have very small amounts of each ability and those who show at least average promise. Experimentation with such tests has laid a foundation on which improved instruments may be developed in the near future, but for a time guidance and prediction must be conducted with caution.

Prediction of Success in Particular Academic Subjects.

Readiness and prognosis tests have been designed to give a higher prediction of success in specific subjects than does the intelligence test. Some of them are distinctly valuable for giving teachers an estimate of the ease with which pupils may learn a subject and the levels of achievement that they may be expected to reach. Since many of the readiness and prognosis tests give higher correlations with particular subjects than does the intelligence test, they provide useful bases for the selection of courses, especially at the high school level. Skillful combination of prognosis, intelligence, and achievement tests, to be discussed more fully in the next chapter, will make counseling still more accurate and effective.

Diagnosis of Subject Matter Difficulties. At the elementary school level, where a child has little choice of subjects, the readiness test is valuable as a diagnostic instrument. Not only is it useful for predicting the child's future success in a special subject, but also it gives the teacher information about the areas in which the child needs more training before he faces the new subject. The readiness test is useful also in placing the pupil at the optimum level of work and in selecting textbooks and other materials of proper difficulty.

A Basis for Class Groups. An alternative to homogeneous grouping on the basis of the intelligence test is the formation

of groups of students of approximately the same level of ability in one particular subject on the basis of scores from readiness or prognosis tests. For example, a teacher may form three or more groups within her class on the basis of scores obtained from a reading readiness test at the beginning of the year. Those obtaining the highest scores are grouped together for more advanced and rapid work. A second group, consisting of those obtaining the next highest scores, may be formed for more elementary and extensive help; a third group may need considerable more assistance in various lines at a still more easy-going pace, and a low group may be provided with a rich program of "reading readiness" activities for several weeks or months before undertaking full-fledged book reading. Pupils who progress appreciably more rapidly or slowly than was indicated by the tests may be shifted to a higher or lower group. When such a method of subgrouping is used, the class is rearranged for each subject. Thus pupil A may be in the top group for reading, the second for writing, the third for language activities, and the lowest for art work. The number of subgroups may also vary from subject to subject. For example, there may be five for reading, three for writing, two for fine arts, and only one for discussions of current topics. The number of groupings may also vary from time to time for one subject or be different for different phases of the subject. Thus there may be five groups for the word enrichment and word analysis activities in reading, two for silent reading of supplementary books, and only one for reports on outside reading.

Combination of All Information for Educational Guidance. The major recommendation suggested by the facts reviewed in this chapter is that the teacher and counsellor should secure and use as much information as possible about each individual. The prognosis test will be more valuable than the intelligence test for predicting success in particular subjects, and the two combined will be even more effective than either alone. The use of a reading or achievement test

with them will increase the reliability of the prediction still further. Measurement of progress and diagnosis of difficulties from time to time during the course are indispensable in achieving fuller understanding of the pupils' needs. Many other factors such as health, the efficiency of the sensory equipment, interest, persistence, availability of equipment with which to work, emotional adjustment to school and to the home, and various personality traits also influence achievement. It is only when the teacher has as much of this information as possible that she will be able to give the maximum assistance to each child. In the following chapter, attention will be directed to such factors as these.

QUESTIONS AND EXERCISES

- 1 Draw a curve of distribution which we would get if we assumed that individuals are divided sharply into two types. How does this curve differ from the curve of distribution found for I.Q.'s on the Revised Stanford-Binet test?
- 2 Criticize or defend each of the following practices.
 - a Insisting on a long march that all keep step
 - b Organizing companies in the army to get together those of as nearly equal height as possible instead of having a range of heights in each company
 - c Assigning all students the same length of time to master an assignment.
 - d Dividing large college classes into several sections according to their general scholastic ability in the subject in question.
 - e Having the brighter students in this course do fewer exercises than the duller
 - f Having a fixed rule in college that all full-time students must take sixteen points, no more, no less
 - g Having a rule that anyone who passes all examinations gets credit for the course without regard to attendance
3. It has been proposed, inasmuch as individual differences in achievement in college courses are so great, that a scheme of "credit for quality" be adopted. For example, for a grade of A the credit should be 4, for B, 3, for C, 2, for D, 1, and for F, 0. Defend or oppose this proposal.
- 4 In physical recreation in college, should all students be given the same amount and type of exercise?

- 5 In what ways should the methods of teaching bright children differ from those used with dull children? What subjects will the bright probably find most interesting? Which will the dull like best?
- 6 Comment on this statement, "It may be of greater value to society to discover a single gifted child and aid in his proper development than to train a thousand dullards to the limit of their educability."
7. How would you explain the fact that children of superior intelligence when graded with those of the same age occasionally become mischievous, lazy, or bored with schoolwork? Does the occasional report of an eminent man getting along badly in school, if true, necessarily prove that such men were stupid when young or that they were unable to do schoolwork?
- 8 If students were promoted in school from kindergarten to college at a rate corresponding to their mental development, what difficulties of administration would be encountered? What, if any, difficulties in social adjustments?
- 9 Is it your experience that the more intelligent people are more or less socially adaptable? How would you explain the exceptional cases?
- 10 How might intelligence tests be used in vocational guidance? When should they be so used?
11. Which of the several capacities would probably enter into ability to (a) play basketball; (b) golf, (c) drive an airplane, (d) sell life insurance, (e) manage an automobile repair shop, (f) succeed as an electrical engineer?
- 12 How can a test of manipulating mechanical implements be a measure of mechanical aptitude or capacity?
- 13 Do you see any distinction between the type of test we referred to as a prognosis test and the type called an aptitude test?
14. In what other situations in education would it be desirable to have "readiness" tests similar in general character to the reading readiness test described in this chapter?
15. The text states, "The intelligence test is the best *general* measure of a pupil's capacity to succeed in his schoolwork." In what sense is the intelligence test a general measure? Does it imply that the intelligence test correlates equally well with ability to learn different school subjects?
16. Discuss the merits and deficiencies of homogeneous grouping or ability grouping.
17. What is meant by an "intellectual deviate"? Would a very bright child be called an "intellectual deviate"? Explain.

- 18 Of what value is it to a teacher to know the range of mental ages in her particular class?
19. What educational uses in addition to those given in the text could be made of intelligence and aptitude tests?

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CHAPTER IX

The General Nature of Learning — I

Properly conceived, the term "method" in education refers to means of stimulating and guiding learning. Making assignments, asking questions, using verbal illustrations, manipulating visual aids, conducting projects, and other instances of teacher activity are only instrumental; they are valuable to the extent to which they evoke effective pupil learning activities. Therefore, educational procedures that place an excessive emphasis on *instruction* may be ineffectual, for learning is a self-active process. The nature of the *learner's activities* is the most important problem in method. To understand how human beings learn, as a consequence, is basic to the attainment of professional competence. Learning, of course, does not deal merely with academic mastery in a narrow sense. It is an integral part of nearly every aspect of the individual's mental development. For example, the characteristic forms of behavior which are included in the concept of personality are in large part learned. One's attitudes, appreciations, values, interests, and dominant motives are likewise dependent upon experience and training.

If properly motivated so that he remains active over a sufficient length of time, a person will learn many things, even very difficult things, without guidance or tuition. But under such circumstances, although he may attain a desired end result, he may waste a great deal of time and energy in uneconomical methods of learning. He may never employ the most efficient means of performance. There are economical and uneconomical methods of learning; one of the func-

tions of teaching is to guide students to use the most effective ones.

NEEDS AND OPPORTUNITIES FOR LEARNING

Learning Depends on Environmental Demands. Another important purpose of education and of teaching is to provide both *needs* and *opportunities* for learning. The variety and specificity of human behavior are determined in very large part by the demands which the environment makes upon the individual. The child acquires knowledge and develops skill much more rapidly when these abilities are essential to the attainment of desired goals than when they are merely assigned tasks. This is one of the reasons why the modern reading program emphasizes the purposes for which children read. The specific skills and abilities of reading are conceived as means for getting thought and for putting the results of reading to some constructive use. These instrumental techniques, however, are so complex that a large number of purposive reading activities, carefully graded, must be provided over a long period of time if they are to be mastered. Working together, the teacher and the pupil must formulate interesting and worth-while goals which will make a great variety of adjustments necessary and which will stimulate the acquisition of information and understanding in many fields.

The importance of multiple environmental opportunities and demands is evident in the development of interests and social behavior. There are few, if any, innate or natural interests. On the contrary, interests are products of environment and culture. "Once we recognize," points out the child psychologist, "that the content of interests is created by the total environment in which the child is located, and see that there are only very few absolutely 'natural' interests, then it becomes clear that one of the important functions of the teacher is that of setting the stage for the child's interests by her own enthusiasms, spontaneity, and personal interests in activities and materials"¹ The movement to relate school-

work to the interests and needs of children is a significant advance, but teachers must remember that it is as important to stimulate new and productive interests as it is to capitalize the available ones. To accomplish this the school should provide an environment rich in stimulus and vigorous in stimulation.

The individual's ability to interpret social situations and to respond to them adequately is also a function of the amount and diversity of experience he has had in reacting to others. Here, as elsewhere, the ability to discern the critical patterns and details in a situation develops with practice. As one observes the effect of his behavior upon the reactors which others in turn make to him, he selects modes of social response that may persist into maturity. The socializing influence of the school environment, in and out of the classroom, is therefore one of its most pronounced educative forces. It follows that the school should deliberately try to create a variety of constructive social situations in which all children should be encouraged to participate. It should also strive to create a social atmosphere conducive to desirable social attitudes and wholesome personal relationships.

Competition and Cooperation Develop from Social Demands. Recent studies of the social development of children and adolescents reveal that both competitive and cooperative behavior grow out of the social demands made upon individuals and from the sanctions which the group places upon certain actions. Society often demands and rewards rather inconsistent response patterns. Under such conditions, the individual may develop correspondingly contradictory behavior. Observations of social development, for example, have shown that sympathetic behavior grows side by side with aggressive tendencies. "Children are taught at certain levels and in certain situations," one investigator points out, "to be social, considerate, sympathetic, polite, cooperative, and the like, and yet in other situations, the *emphasis* is on self-defense and other self-regarding behavior."² It is probable that

competitive tendencies are no more innate than cooperative ones, and that both cooperative and competitive activities are learned in response to social requirements. The same author explains the process of social development as follows:

... we have no a priori basis for expecting sympathetic behavior to be more dependent upon learning than is angry behavior. At least, distress when others are distressed seems primitive, naive, and reasonably universal, without inculcation by adults. In both anger and sympathy, techniques of response are learned from grown-ups and child associates, the situations to which one may respond with the techniques thus acquired are also learned, and in each case the culture determines the amount as well as the character of the responses.³ We may indeed say in general that sympathetic behavior increases relatively in any individual or group, and insofar as the situation is conducive to it.⁴

Development of Democratic and Autocratic Behavior.

A recent study (described in a previous chapter) of the effect of democratic and autocratic atmospheres upon the behavior of junior high school boys shows how definitely the form of social organization influences individual behavior and social relationships. Two groups of ten- and eleven-year-old boys were observed under conditions of authoritative direction and control by an adult leader in the one case, and under a democratic atmosphere of cooperative planning and execution among the boys and the leader in the other case. The autocratically controlled group developed greater hostility among the members; prompted solitary rather than social activity; and fostered personal dislikes, submissiveness, and resentment toward the leader. The democratic atmosphere, on the other hand, was much more conducive to cooperative activity, objective and impersonal reactions, more constructive effort, and a feeling of group membership.⁵

School Should Guide Development. The foregoing illustrations should be sufficient to emphasize the fact that, within the limits of his potentialities, the child may develop in several directions, depending upon the nature of his experience. It is the teacher's function to guide the developmental process.

"An environment can be set up," it has been pointed out, "to train either for stability of response, obedience, narrowness and rigidity of attitude or for versatility of response, the exercise of judgment, self-reliance and a broad attack upon life's problems. Such directional tendencies seem not to be given by experiences with any single bit of subject-matter or the mastery of any single skill, they are rather life patterns which become set from the general context in which the educational venture is carried forward. They depend in part at least, upon the range of stimulation, the attitudes common to experiences, the context in which experience is had, and the capacity to tie the elements of a life into an integrated whole." ⁶

With an understanding that the task of the school is to provide needs and opportunities to learn, and to guide as well as to stimulate the process, we turn in this and the next chapter to a discussion of the general characteristics of human learning. The two subsequent chapters will treat the conditions of economical learning, and still later sections will consider such specialized problems as the acquisition of meanings, the improvement of reasoning, and the means of making learning products effective in new situations

DEFINITION OF LEARNING

Learning may be defined as the progressive change in behavior which is associated, on the one hand, with successive presentations of a situation, and on the other, with repeated efforts of the individual to react to it effectively. Learning may also be thought of as the acquisition of ways of satisfying motives or of attaining goals. It often takes the form of problem solving. Learning occurs when old ways of acting are incapable of overcoming obstacles or meeting new conditions.

One could give many illustrations of changes in behavior with experience. For example, learning often takes the form of increased skill or precision in performance, or of an increase in the rate with which an act is executed. In the early stages of the development of a skilled performance, there are usually

diffuse and irrelevant reactions, or awkward, unrhythmic, and poorly coordinated movements. With the proper sort of practice, however, the unnecessary responses usually drop out, and the poorly patterned reactions give way to smooth execution. One might describe this course of development by saying that learning is a process of improvement.

Learning also occurs when the details become explicit in a situation which the individual first grasps in only a general way. For example, the student may sense in broad outline certain relationships between production of goods and economic prosperity. As he explores the problem, however, he finds that a tremendous number of facts and processes must be considered before he fully understands the complex interrelationships of production, distribution, and consumption. Not only will some of his preliminary ideas become more explicit because of his greater grasp of factual detail, but other tentative conceptions will be revised in the process of exploring the problem and securing information about it.

Learning activities differ in the extent to which the individual has to discover the appropriate response. In many instances, the situation and the response to be learned are identified for him. Learning a list of nonsense-syllables involves little discovery and practically no meaning. Such an exercise is ordinarily called rote learning. Learning to recognize or use the word "doll" to represent a certain object is another case in which discovery of the correct response plays a negligible role. Learning that $5 + 4 = 9$ might take place in the same way that the word "doll" becomes attached to the object. But simple number combinations may also be learned by methods which stress discovery of the correct answer. For example, the child might count blocks or other objects, or derive one combination from another.

Examples of learning which involve a large element of discovering and understanding relationships are found in problem solving. Problem solving is a process in which the individual overcomes an obstacle to the satisfaction of a

motive, or complex of motives. If the solution demands a complicated pattern of responses, or involves the reorganization of previous experience in a difficult fashion, so-called trial and error behavior ensues. In these instances, the critical considerations are the appearance, recognition, and selection of correct responses, and their integration into a closely knit pattern; the elimination of the incorrect or uneconomical reactions, and the ultimate stabilization of the complete act or solution.

LEARNING AND MATURATION

Learning Depends on Level of Maturation. Both maturation and learning contribute to the development of the organism. The two processes are so closely interrelated that certain psychologists tend to use the terms synonymously. That learning involves growth is apparent when it is expressed in terms of improvement, differentiation, and problem solving. But for practical purposes learning may be distinguished from maturation.

Maturation, it has been pointed out earlier, is growth that takes place without special conditions of stimulation, such as training and practice. Many activities appear in children's behavior in about the same order and at about the same time even though the children have been subjected to rather great differences in environment. The appearance of these activities is closely associated with the physiological development of the organism. Learning, on the other hand, is a change in behavior that depends upon special conditions of stimulation. What the child learns, therefore, depends to a great degree on the nature of the environment and the character of experience. Whether he acquires certain skills and abilities will depend upon the opportunities he has to learn them and the kind and amount of practice rather than upon general growth of physical structure.

Maturation versus Specific Training. Although a discussion of the developmental sequences in behavior that seem to

depend largely on the growth of the individual has appeared in Chapter II. it may be well to review here, briefly, some of the experimental findings. Hilgard⁷ gave an experimental group of young children intensive training for twelve weeks in buttoning, cutting with scissors, and climbing a ladder. The control group received no training. When tested at the end of the training period, the experimental subjects were superior on all the tests to the control children. After one week of training, however, the control subjects reached a level of performance in climbing equal to that of the group which had had twelve weeks of special exercise. Although the improvement of the controls in one week of practice on buttoning and cutting was rapid, their score at the end of the week did not quite reach that of the experimental group.

Strayer⁸ studied the relative efficiency of early and deferred vocabulary training for a pair of identical twins, T and C. In twenty-eight days of training, Twin C acquired a vocabulary equal to that which the other twin had developed in thirty-five days of training at an earlier age. However, at the end of the experimental period the trained twin was somewhat superior to the control, an advantage, nevertheless, which had disappeared three months later.

McGraw,⁹ also using the method of twin control, found that activities necessary for normal development were influenced little if at all by special practice. Such activities included crawling, walking, and prehension. Other behavior not necessary for normal growth, such as swimming, climbing, skating, jumping, and the like, was greatly influenced by training. Favorable attitudes toward the experimental tasks, which transferred to other situations, constituted one of the most important differential outcomes of the training. One of the twins which McGraw experimented with was introduced to roller skates at the age of 350 days, and acquired at the age of 694 days, or less than two years, reactions which "consisted primarily of the broad, rhythmical, body sway which is characteristic of a professional skater." Her results indicate

that specific training may be given either too early or too late for greatest effectiveness. Learning is not independent of maturation, but must be based upon a sufficient stage of growth. Practice is most productive when properly articulated with maturational level.

Apparently, the relative effects of maturation and training differ when improvement in specific and simple activities is compared with growth in a more complex skill. It was discovered that control children, untrained except for the necessary testing experience, fairly soon after the experimental period reached the level of performance of a comparable group given specific practice in color naming. The same was true for practice in strength of grip. Training of three-year-old children in singing, however, gave quite different results. In this case, instead of practicing specific tones, the children in the experimental group were encouraged to attempt new tones. The training covered a period of six months. At the end of this time, the trained subjects showed a marked superiority to the controls, and they were still superior when tested again several months later.¹⁰

These studies reveal that, under certain conditions, it is definitely advantageous to give young children training in skills for which maturing capacity alone is inadequate. The development of motor skills at early ages probably lays the foundation for greater proficiency in later performance. Furthermore, these activities give the child a greater control over his environment, and so enable him greatly to extend his experience. Early practice may also forestall the acquisition of habits which might interfere with the development of skills at a later time. One of the most important purposes of encouraging the development of such skills as singing in young children is to reveal special aptitudes which the school and the home should nurture.

Readiness to Learn. Research in mental growth and in the conditions of effective learning has called attention to the problem of *readiness* to learn a given task or to acquire skills

and abilities along a wide front of experience. Readiness for learning to read, for example, is intimately related to the child's mental, physical, emotional, and social development. The child's mental age is by no means the only factor related to his ability to profit from reading instruction. The maturation of physical equipment, including the sensory and reacting mechanisms, is important, but, even in combination with mental age, does not provide an adequate basis for success in learning to read. There are many additional factors related to readiness, including the following: ¹¹ keen interest in reading; reasonably wide experience, facility in the use of ideas, ability to solve simple problems and to do abstract thinking of a very elementary type; ability to remember ideas, word forms, and the sounds of words; a reasonable range of vocabulary; command of simple English sentences; ability to discriminate word forms and word sounds, emotional stability; and some degree of social adjustment. A comprehensive investigation of reading readiness, involving sixty-eight different factors, showed that the following abilities were most predictive of success in learning to read: word recognition abilities; grasp of story structure; familiarity with printed words, letters, phonograms, and familiarity with auditory features of words shown by tests of rhyming, blending, and giving letter sounds. The authors of this study pointed out that "these are abilities which children can and do learn and which may be taught in the home or school" ¹² The fact that the abilities most closely related to progress in beginning reading depend upon experience and training is of fundamental import. Preparing a child to read is certainly more than merely letting him grow. Guidance and basic training are essential both in the preparatory stages and in the actual process of acquiring reading skills.

Grade Placement. Efforts have been made to determine the proper grade placement of arithmetic topics by finding the mental ages at which the requisite abilities are most effectively learned. As a result of these investigations, there

has been a tendency to shift topics upward in the grades. For example, long division, which was commonly taught in the fourth grade, is now being postponed until the fifth. But readiness in arithmetic, like other activities, is a function not only of inner growth, but also of previous experience, methods of learning, interests, attitudes, and purposes. Because of the complexity of the underlying learning factors, it is very difficult to assign a given task to a given grade or mental age. Preliminary investigation indicated that a mental age of six years and six months was necessary for efficient work in the early stages of reading. More recently, however, it has been shown that by adapting materials and methods to the individual, children less mature in mental age can make satisfactory progress. Gates found that several classes in which the average mental age ranged from five to seven years reached the same standard of reading achievement. He and his associates concluded, therefore, that "there is no mental age, within these limits at least, which can be set down as minimum or optimum for beginning reading in general."¹³

Readiness Depends upon Stimulation and Training.

The importance of stimulation and training in the development of readiness to learn is apparent in the extent to which pupils understand and appreciate literature. Children who have traveled widely, met many different people, and read extensively are likely to be much more mature in literary interests and comprehension than children with limited experience.

An environment that provides varied stimulation is likely to encourage not only intellectual interests, but also a wide range of skills. Children who are surrounded with automobiles and the many other mechanical inventions which are a common part of today's environment may have many more skills than those who lived in a previous period. At least the young people of today are likely to have different skills from those which were learned under different patterns of environmental stimulation.

The foregoing illustrations make it clear that readiness is a

complex of inner growth factors and the results of training and experience. The relative contribution of maturation of the organism and of previous learning in the acquisition of behavior at any one time is a function of the age and experience of the individual and the nature of the task. In preschool and primary school children, the level of inner growth undoubtedly plays a more significant role in learning than it does in later years. In considering the relation of experience to readiness, one must remember that previous learning may in some cases facilitate further adaptation, and in other cases tend to inhibit development.

In spite of the complexity of the readiness problem and the difficulty of assigning specific tasks to particular grade or mental age levels, the importance of adjusting the curriculum to the developmental stage of the individual must not be underemphasized. Successful performance is necessary for persistent and effective learning activity. But since successful performance is a function of so many factors, among which motivation is extremely potent, it is wiser to think of a range of grades or mental ages within which learning activities may be undertaken rather than to assign them arbitrarily to one grade or age. Furthermore, social demands may create needs on the part of children which would justify efforts to learn, carefully adjusted to the individual, somewhat earlier than the point of maximum economy of time and effort.

PROCESS OF LEARNING

Product and Process of Learning Distinguished. Remembering that learning is a form of *growth* that is correlated with special conditions of stimulation should help one to understand the distinction between *product* and *process* of learning. Learning products are represented by such terms as "knowledge," "meanings," "skills," and "attitudes." The process has to do with the course of development that takes place between the first attempts at performance and the ultimate stable behavior pattern. The ability to respond almost automatically

with "9" to the situation " $5 + 4$ " is an *end result*. Studies of how children learn the combinations show conclusively that the individual's behavior changes with successive efforts to respond correctly and rapidly to a number situation.¹⁴ First of all, the ability to learn the simple number facts effectively depends upon a great deal of experience with concrete number. Making gross comparisons of "more," "less," "equal"; manipulating and counting real objects; and presenting the apprehension of concrete number in the form of dominoes or other geometric patterns are important backgrounds for arithmetic readiness. Habituation of the addition, subtraction, multiplication, and division combinations is a final process preceded by progressively more mature forms of solution. These stages are (1) counting all the objects, (2) partial counting, such as "8-9, 10, 11, 12", grouping, such as "8 and 2 are 10 and 2 are 12"; and multiplication and conversion, such as "three 4's are 12," and "8 and 4 are 12, so 8 and 5 are 13."

Learning Is a Developmental Process. The fact that the child's overt behavior appears to be approximately the same when he repeats "8 and 4 are 12" over and over again merely disguises the underlying developmental process. If the child is asked to make from the beginning the exact response desired as the end product, he may resort to his own methods of making the situation meaningful and of arriving at solutions. Without guidance he will often habituate immature procedures such as counting or partial counting. Evidence indicates that more drill of the purely repetitive sort does not always take children who are using immature methods to the point of satisfactory mastery.¹⁵ In fact, purely repetitive methods of learning may actually foster undesirable forms of response which can be surmounted only with great difficulty. What the teacher who recognizes the fact of behavioral development will do is to *guide* the child's progress toward final stages.

Learning to recognize words meaningfully in reading also illustrates the developmental nature of learning. Children no longer practice word recognition in lists, but in meaningful

context. Word meanings grow, not by continuous repetition in the same situation, but by recognition and use in a variety of thought-getting activities.

A recent investigation of growth in understanding of geographical terms provides additional insight into the nature of conceptual development. One hundred children each in grades four to seven, inclusive, were tested on the meaning of geographical terms selected for the most part from their textbooks. The test battery included the essay and multiple-choice types, supplemented by a map identification examination and one requiring location of terms on a globe and on concrete models. The analysis of test results indicated that growth in understanding proceeded in the following ways (1) through an increase in the number of different kinds of meanings, (2) through an increase of relevant general information; (3) through a substitution of basic for associated meanings, that is, through awareness of central, rather than very marginal, meanings; (4) through the extension of central meanings to include more pertinent details; and (5) through a reduction in errors, or incorrect meanings and details¹⁶

As research in human learning has turned more frequently from the laboratory to the schoolroom, from nonsense syllables to meaningful tasks, and from attention to how individuals learn as well as to what they learn, the genetic character of learning plainly emerges. Learning and maturation are two aspects of the fundamental process of individual development.

Learning as Improvement. The fact of progressive change in the response pattern in the acquisition of skill has always been much more apparent than in ideational learning. Obviously, the individual cannot practice, try as he may, the final precise form of a complex act, such as driving in golf, from the beginning. Furthermore, if practice meant sheer repetition, he would never attain a skilled performance, for he would reproduce continuously all the errors and inadequacies of his first trial. Observation of the development of skilled behavior leads to a definition of learning as a series of progressive

approximations to a successful performance. It is now becoming equally apparent that learning means improvement, not only in the acquisition of skill, but also in such fields as arithmetical computation, word meanings, and geographical and historical information and understandings. Development is a pervasive characteristic of human learning.

INTENT TO LEARN

Since learning is such a complex process, it is not surprising that it takes place most surely when one *intends* to learn and remember. We are often able to recall, of course, many of the things that have been in the margin, rather than the center, of attention. But this kind of *incidental* learning is not trustworthy. The results are too accidental. Sometimes only passing reference or casual observation will be sufficient to learn; more often they will be ineffective. Experiments have demonstrated that one is often unable to recall many details of objects he has handled numberless times or of scenes he has passed regularly. These facts suggest that the safest procedure is to attend directly to the important facts and principles or the essential skills to be acquired. ¹

How is this conclusion to be reconciled with proposals for having pupils learn indispensable skills and abilities in spelling, reading, language, arithmetic, and other subjects incidentally? Can one dispense with specific instruction in spelling, and expect the individual to learn to spell through activities in language and reading? Is it possible to master the rather difficult understandings and abilities involved in handling decimals when they are practiced only in connection with activities or projects in which the arithmetical skills are incidental to the primary outcomes?

In asking and answering such questions as these, it is unfortunate that the word "incidental" has been so commonly used, for it connotes "undeliberate" or "unattentive." The essential skills and abilities in spelling, reading, language, and mathematics are extremely complicated and highly organized. The

fact that they should be acquired in the service of purposes which are broader in their significance than the tools themselves does not mean that they can be learned casually. Before the child can advance beyond the earliest stages of reading, he must get conscious control over the means of distinguishing one word from another. One of these techniques is phonic analysis. Although this skill should be learned in meaningful context, it must be acquired by explicit, well-directed effort. It is customary now to develop a recognition-knowledge of the vocabulary and grammar of a foreign language in the course of actual reading, but it is necessary, nevertheless, to direct attention to verb forms and other inflections, and ultimately to sense the structure of the language by organizing and generalizing specific experiences. Understanding arithmetical processes mathematically is probably essential for using them intelligently and accurately in social situations. Decimals, for example, should be learned not only in connection with useful applications, but as a phase of meaningful manipulation of the number system.

These are illustrations, not so much of *incidental* as of *instrumental*, learning. The distinction is an important one, for the latter adjective suggests not only that skills and abilities should be acquired as means to ends, but that they should be the object of deliberate, intentional learning. Dewey has expressed this principle succinctly in the following fashion: "Intelligent activity is distinguished from aimless activity by the fact that it involves *selection* of means . . . out of the variety of conditions that are present, and their arrangement . . . to reach an intended aim or purpose" ¹⁷ The selection and arrangement of means certainly implies deliberate and attentive behavior. We may agree with Horn when he concludes that "whatever subject matter is of little value may be left to incidental learning, but what is to be remembered should at some time be in the focus of the student's attention and subjected to his determination to remember it." ¹⁸

Attitudes, which are responses in which there is a strong

emotional component, seem to be somewhat less dependent upon intention and definite practice than other learning outcomes. For example, without exactly intending to do so, one may develop strongly favorable or unfavorable dispositions toward a school subject, or toward school tasks in general. Unlike understandings and skills, such attitudes appear to be more influenced by the general tone and atmosphere of the environment than by direct and formal instruction. They may take form from one experience, in contrast to the extended effort necessary to acquire skills and understandings. The effect of the situation as a whole upon emotionalized attitudes was undoubtedly what Dewey had in mind when he wrote the following passage ¹⁹

Perhaps the greatest of all pedagogical fallacies is the notion that a person learns only the particular thing he is studying at the time. Collateral learning in the way of formation of enduring attitudes, of likes and dislikes, may be and often is much more important than the spelling lesson or lesson in geography or history that is learned. For these attitudes are fundamentally what count in the future. The most important thing that can be formed is that of desire to go on learning.

This interest in learning, coupled with conscious acquisition and control of the methods of economical learning (which are the product of deliberate effort and specific attention during learning experiences) are the best guarantees of continued independent growth.

MOTIVATION

Some discussions of the dynamics of learning seem to imply that motivation is something "added" to an otherwise apathetic attempt at learning in order to speed up and sustain the process. Such an interpretation is untrue, for basically there is no such thing as unmotivated learning. Efforts to improve, it is true, are more or less energized, or well or poorly directed, but the differences are of degree and not of kind. Motivation is the *sine qua non* of learning.

To make an inventory of human motives is an extremely difficult task. If one is content with a list of the organic cravings, such as hunger, thirst, sex, and the like, the problem is relatively simple. An attempt to enumerate secondary drives, such as the desire for social recognition and approval, the need for a feeling of personal worth, and the desire for effective effort, is much more complicated, for the list becomes extensive. Although psychologists once offered lists of "instincts" as impelling forces, they now generally recognize the futility of trying to distinguish "innate" from "acquired" drives. It is still fairly common, however, to state that the wealth of interests and activities which motivate mature behavior are grafted, even if remotely, upon the basic organic cravings. It is probably better to assume that what actually occurs is that "an elaborate process of learning and growth intervenes between the organic wants of infancy and the cultural wants of adulthood, involving all manner of linguistic, imagined, and rational factors that ultimately transform the segmental cravings of infancy into desires having no longer any functional connection with them, but holding in their own right an autonomous place in personal life."²⁰ Teachers will find it profitable to base their procedures on the proposition that "motives are almost infinitely varied among men, not only in form but in substance. Not four wishes, nor eighteen propensities, nor any and all combinations of these, even with their extensions and variations, seem adequate to account for the endless variety of goals sought by an endless variety of mortals."²¹

For the purpose of stimulating learning, it is unnecessary to distinguish — even if it were possible — original from acquired motivations. It is essential for the teacher to know *what* "springs to action" might be unleashed in a given individual, and how to capitalize them by the situation at hand. Perhaps the most successful efforts to adapt the materials of instruction to the learner's interests have been in elementary school reading, both in the basic textbook series and in books for extensive

reading. Excellent studies of children's interests have provided the basis for this achievement. The "experience approach" to literature in the secondary school is also bringing it closer to the needs and problems of adolescents. Writers of science textbooks for junior and senior high schools have tried to answer questions which secondary students themselves have asked. The study of the community, and the study of sociological, political, and economic facts and problems around contemporary problems, have made the social studies more interesting and realistic at both elementary and secondary levels. Certain educators recently have made attempts to organize the program of the high school as a whole around the needs and characteristics of adolescents.

It would be shortsighted, of course, for the school merely to feed the present interests of its pupils. The wants, interests, and attitudes of the individual at any moment are the means of making experience meaningful and worth while. Out of these experiences, however, new interests and more mature purposes and values should emerge. Dewey has made it clear that we learn through experience, but that not all experience is educative. Activities which, though significant to the person at the time, also lead into more intelligent behavior and open up further means of growth are the ones which the school should encourage. No sensible person would encourage boys who are absorbed in making model airplanes to spend all their time that way. A shrewd teacher, however, might use that interest to activate the study of science, art, social studies, and literature. Aeronautical engineering is applied science. Airplane design is a problem in art as well as in engineering. Aviation has had a profound effect on international relations; the airplane has remade the boundaries and destinies of nations and empires. Charles Lindbergh's *We* and Anne Lindbergh's *Listen: The Wind* and *North to the Orient* transform adventurous air travel into literary experience. Thus may interests and motives of the present make bridges to activities and desires of the future.

Functions of Motives. Motives serve three functions in the learning process. First, they energize behavior. Motives release energy and arouse activity. Certain motivating conditions occur primarily within the organism. Thus such bodily conditions as thirst and hunger induce muscular and glandular reactions, and even ideational responses which through experience have become related to organic conditions. Stimuli from the environment, in cooperation with internal conditions, are also capable of evoking adjustive behavior. Such incentives as praise, reproof, reward, punishment, money, food, and even the anticipation of these conditions, are motivating factors. Goal sets and other determining tendencies are powerful conditions, especially if they are closely connected with the individual's wants and if the outcomes are highly valued.

Some motives and incentives energize behavior more than others. Teachers have often given gold stars for books read or tasks mastered. These rewards are likely soon to lose their potency. Furthermore, if reading books proves intrinsically worth while by providing enjoyment or the knowledge with which to accomplish some important end, stars are unnecessary. School marks may sustain a modicum of effort during the period of formal education, but unless learning has become interesting in itself and instrumental to the satisfaction of felt needs, intellectual growth will probably cease with the end of schooling. Fortunately, however, activities which at first are supported by extrinsic incentives or formal regulations may become intrinsically interesting. This transformation happens all too infrequently, however, because most of the conventional goads which schools apply are forms of compulsion. It is quite possible for the aversive attitudes often stimulated by these forces to spread to the activities involved and taint them.

Selective Function of Motives. In the second place, interests and motives are selectors. They dispose the individual to react to some situations and to ignore others; they determine in considerable part *how* he will react to certain situations.

When an interest system has been formed it not only creates a tensional condition that may be readily aroused, leading to overt conduct in some way satisfying to the interest, but it also acts as a silent agent for selecting and directing any behavior related to it. Take the case of people with strongly marked esthetic interests. . . in scanning a newspaper they will observe and remember more items pertaining to art; they also take a greater interest in clothes than do non-esthetic people, and when they are asked to rate the virtues of others, they place esthetic qualities high. In short the existence of a well-established acquired interest exerts a directive and determining effect on conduct just as is to be expected of any dynamic system . . . ²²

Human beings are always acting selectively, picking and choosing out of all the situations which confront them those to which they respond. When reading for a certain purpose, for example, one attends primarily to those statements which are relevant to it, and is only cursorily aware of other parts of the selection. Scanning is a search for material bearing upon a specific topic or problem; one stops to read carefully only the sections which are especially pertinent. Several persons may give very different reports of a lecture, for they may have attended it for different purposes, have approached it with varied interests, or have interpreted it through different backgrounds of experience. These phenomena, results of the selective operation of *mental sets*, emphasize the importance in learning of clearly defining the task. Merely "reading a lesson" or just practicing is a poor way to learn. Efficient study is purposeful study directed toward explicit goals.

Even rats act selectively on the basis of differential motivations. This has been demonstrated by having the animals first learn that by taking one direction they secure food and by going in a different direction they find water. Afterward, when the animals are given a choice of these two responses, they take the one direction when hungry, and make the other reaction when thirsty.²³ In both rats and men, motivations and incentives determine the *utilization of previously learned responses*.

There is another important way in which motivation determines selection of response. When the organism is acting under the impulsion of a strong motive and encounters an obstacle to the satisfaction of the need, it "tries" one reaction after another until the motivational tension is relieved. After repeated occurrences of substantially the same motivating and thwarting conditions, the ineffective trials tend to drop out, and the organism makes the successful response at once. Reactions are selected and learned because they are functionally related to wants and motives.

Motives Direct Behavior. Closely associated with the selective function of motives is their role in *directing* behavior. It is not enough to activate an organism. The energy released and behavior evoked by hunger are ineffective unless action is directed toward some object that is capable of satisfying the drive. Complacent persons learn very little, but to make them dissatisfied with their present condition is not enough to ensure growth. It is when their energies converge upon well-defined and attainable goals that improvement takes place. This principle has far-reaching implications for educational procedures.

Instruction in oral and written composition has been notoriously inefficient in relation to the great amount of time the schools at all levels have devoted to it. Half the battle of teaching and learning would be won by creating an interest in improvement and making correct usage and effective expression a desirable goal in itself, or essential for the attainment of other valued ends. Time spent in drilling perfunctorily on exercises in correctness is mostly wasted. Conventional theme-writing assignments, equally purposeless, should be replaced by having students write the things they want and need to write. Recently a student asked one of the instructors in a writing laboratory when a letter written in the laboratory and submitted for final appraisal would be returned. The instructor replied that press of other work made it necessary to postpone correction of the papers for several days. "But I

must mail my letter at once," insisted the student. Compare the urge to write represented in the realism of preparing a good letter to mail with that generated in a formal composition class where, too often, the student writes on a topic of little concern to him for an instructor who, he knows, does not want to read his paper. The requisites for improvement in speaking and writing are something to say, clearly thought through; a real desire to communicate these ideas, and an audience to which to address them.

However, these conditions, essential as they are, are not sufficient. Goals and purposes must be clearly perceived, not only with respect to the broad pattern of response, but also with regard to significant details of performance. If training in expository writing, for example, is to be most fruitful, both teacher and pupil must have an explicit, reasonably expanded and concrete statement of the characteristics of good composition. Instructors in the writing laboratory referred to above aid the student to make a deliberate choice of methods for realizing his purposes in each piece of writing.²⁴ The successful adaptation of means to end, the economical learning of techniques, and persistent motivation necessitate a knowledge of just what the characteristics of a successful performance are.

Learning cannot be successful or efficient without persistent, selective, and purposeful effort. There is no more important problem in teaching, therefore, than that of motivation. This means, as Dewey points out, that "attentive care must be given to the conditions which give each experience a worthwhile meaning." Learning experiences are meaningful when they are related to the individual's interests, when they are involved in his living, when they not only contribute to his purposes at the time but enable him to make more intelligent adjustments in the future, when they involve discovery and problem solving rather than formal drill or mere memorization, and when they result in satisfying social relationships. Teachers and pupils, working cooperatively, should set up

goals which will make that kind of learning possible and necessary, and together plan the effective means of realizing these purposes. To do so will take time, but it will not be wasted time, for the preparatory and initial stages of learning constitute an essential orientation for the process as a whole.

SUMMARY

Learning is modification of behavior through experience. What man learns is determined on the one hand by his constitution, and on the other by the demands which the environment makes upon him. Of all the animals, man is the most flexible. He inherits relatively few fixed ways of reacting. His interests, attitudes, appreciations, skills, and abilities are primarily the product of learning. Although the limits of his development and the foundations of his special talents are set by hereditary factors, the extent to which these potential attainments are realized depends upon environment and training. Whether an individual is interested in science or in history, whether he likes school or finds it distasteful, whether he is "conservative" or "liberal" in his social attitudes, whether he is honest or untrustworthy, whether he considers a "lick and a promise" enough or is satisfied only with work well done, whether he studies effectively or uses inefficient methods of learning is determined in very great degree by the nature of his experience.

Since the child may develop in several directions, depending upon the character of his experience, it is essential for the school to guide his development. Children don't just grow. Growth is a response to stimulation. The particular behavior patterns an individual acquires are therefore the result of specific forms of experience. Furthermore, there is no reason to believe that an immature person will be able to originate or to choose educational activities that are instrumental to the acquisition of desirable forms of behavior. The school exists for the purpose of providing a carefully planned sequence of experiences calculated to make the most of each individual's

potentialities. It is not a reprehensible intrusion for the teacher to guide the pupil's development, provided she respects always the integrity of the child's personality and is careful to see that each activity is a meaningful and worthwhile experience for him. On the contrary, it is the definite responsibility of mature persons to lead the young into activities which are really educative, which will result in progressive development in desirable directions.

The effectiveness of learning activities depends upon the level of inner growth which the organism has attained (maturation) and also upon the results of previous learning and experience. Each new learning situation should be articulated with the pupil's level of mental development and previous achievement, as well as with his methods of learning, interests, attitudes, and purposes. This means, of course, that education at all ages must be individualized much more extensively than it now ordinarily is. Pupils vary greatly in all the factors that underlie readiness to learn any given task. Grade placement of learning activities can be related only to the expected level of development of the "average" pupil. Within each grade, regardless of whether liberal or strict promotion policies obtain, there must be adaptation of curriculum to individual pupils. Each one should take the step for which he is ready. Within any one grade, some persons will progress much more rapidly than others; the members of the grade will start the year and end the year at widely varying points.

Learning is a process of improvement. Progress, however, depends upon the intent or the will to learn. Incidental learning, that is, learning which is not deliberate or purposeful, is not reliable; the individual may learn or he may not. Whatever one wishes to learn surely he should learn systematically and designedly. Instrumental learning, in other words activity which is a carefully and intentionally chosen means to some desired end, is not incidental. It is highly conscious and definitely purposeful.

Motivation is an essential condition of learning. Motives

which are significant in the educative process include interests, attitudes, needs, and purposes. Such factors as these energize behavior, make it selective, and direct it toward certain ends. Learning is most efficient when the activities to be performed are the means of satisfying needs or attaining important goals. Education must do more, however, than cater to the present interests and purposes of the individual. The great variety of motives in human behavior is brought about by learning, and it is therefore the function of education to stimulate the development of new and more mature and more productive interests and purposes.

QUESTIONS AND EXERCISES

1. Interpret the proverb, "You can lead a horse to water but you can't make him drink," with respect to a principle of educational procedure discussed in this chapter
2. Can you give examples of two "natural interests" which children have? How, in view of your examples, have you chosen to define "natural interests"?
3. What might be the effect of punishing a child by making him stay in after school to write all misspelled words twenty times each?
4. From your own school experience give examples of the three ways mentioned in this chapter that motives function in the learning process.
5. Turn to the outline of this chapter in the Table of Contents, and summarize in one sentence what you consider to be the most important feature of each section
6. Define a motive Which of the following could satisfy the definition: *a* A tickle in the throat; *b*. The idea of becoming a fine singer, *c*. A toothache, *d* The habit of sleeping after a meal; *e*. The desire to do and say funny things
7. Suggest three situations in which a child may do incidental, emotional learning in the course of class activity. Draw a diagram to show how this occurs. To what extent can a teacher control attitudinal learning?
8. Explain the statement in this chapter that "Motivation is the *sine qua non* of learning." Under what circumstances, if any, can a child go to school and yet learn nothing? *a*. If he is mentally very dull? *b*. If he is disobedient and resentful toward

the teacher? *c* If he is so exceptional that he is years, mentally, beyond his brightest classmates? *d* If he seems too indolent to try?

9. Do you agree with the statement, "Artificial incentives such as gold stars, honor rolls and prizes have no legitimate place in modern educational practice"? Explain your position.
10. Under what conditions do you think a "democratic" organization can be used successfully with school children? (*a*) for a boys' club meeting? (*b*) for a spelling lesson? (*c*) for a standardized achievement test? (*d*) for a geography project? (*e*) when the school superintendent is visiting the classroom?
11. Defend and then criticize the statement that in order to get through school sooner children should begin their first grade work at five years of age.
12. In what way did the old-fashioned one-room schoolhouse provide opportunities for learning that are lacking in many of our present-day schools? How are opportunities for learning provided for exceptional children in modern schools?
13. In what respects is the learning of animals like that of man? In what respects is it different?
14. Cite instances in which both competition and cooperation are taught in practically the same learning situation.
15. Is the problem of maturation one which applies only to the learning of young children? Do you think there are forms of learning which depend on maturation in adult years? Under what circumstances?
16. Name a dozen things which people do to secure social approval. Evaluate the strength of this impulse. Trace its development to maturity.
17. Why did psychologists at one time regard the distinction between an instinct and an acquired drive one of great significance? What is the usual attitude now?
18. There have been various doctrines based on the assumption that "nature is right, there can be no higher criterion." It is asserted therefore that children should be permitted to develop without inhibition, that they should be permitted to do whatever is "natural" for them to do, on the assumption that nature is infallible, that no natural trends can be undesirable. In the light of available facts, how valid is this doctrine?

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CHAPTER X

The General Nature of Learning — II

In understanding human learning, it is more instructive to discover what happens when the individual attacks a rather complicated situation than when he memorizes a list of nonsense-syllables, which is often called rote learning. In the former case, the critical problems have to do with the *discovery or appearance* of the correct responses, the *selection* of the appropriate reactions and the *elimination* of the incorrect ones, and the *organization* and *fixation* of the adequate reaction pattern.

AN OUTLINE OF THE LEARNING PROCESS

From an analysis of a large number of experiments in learning, the following outline of the process has been derived: ¹

1. The subject must be motivated.
2. A field or complication of motives exists.
3. Obstruction is offered to the principal motive.
4. Hyperactivity is aroused.
5. The response is multiple and varied.
6. The response is to relations of stimuli.
7. The most important relation is between means and objective.
8. Selection or least action appears.
9. The selected responses originally occur fortuitously.
10. The effects of responses are crucial.
11. The rate of learning varies in degree from gradual to abrupt.

“Trial and Error” Behavior. When the problem which confronts the individual is such that no ready-made solution is adequate for solution, or is so complex that previously learned reactions cannot be easily integrated for managing it, what has ordinarily been called trial and error behavior ensues. “Trial and error behavior,” however, is a misleading term. The responses which human beings make to problem situations are seldom if ever random. They are often fairly systematic and usually somewhat relevant, at least, to the situation at hand. Motivating conditions — the organic state of the organism, the attitudes, interests, the sets and readinensses, particularly the goal sets of the person — serve to narrow down the range of responses that might be made. The individual’s perception of the situation, his interpretation of it, his identification of its significant aspects, also help to determine what responses out of all those previously learned he will try out. The trials, therefore, are not chance reactions, but often are systematic variations.

The more explicitly one defines the objective and the more carefully he searches for relevant previous experiences, the more fruitful the successive attempts at solution will be. Other things being equal, the greater the number and variety of possibly useful attempts, the greater the opportunity for the successful responses to occur.

The Role of Exploration. Before the essential relations in a problem situation can be fully perceived, or in many instances even vaguely sensed, exploration and manipulation may be necessary. An episode which Köhler describes in his *Mentality of Apes*² illustrates this function of multiple responding. The ape, reaching through the bars of his cage, struggled unsuccessfully to secure a banana lying just beyond the length of his arms. On the other side of the cage, *outside the ape’s vision* as he was looking at the fruit, was a stick with which he could have pulled in the banana. Giving up, the ape turned away, looked at the stick and even stepped on it. But he saw no relation between the tool and his recent objective. However

when the experimenter moved the stick to the other side of the cage, so the ape could see it in the same field with the banana, the animal perceived the relation at once, and used the pole to haul in the fruit.

Exploration and manipulation may serve to bring objects into a field, or to rearrange the objects within a field, so that their relations, once obscure, become apparent. This is probably also true of problem solving, which proceeds more with verbal or ideational tools and relations than with overt responses. Mulling over a problem, exploring it systematically, "rearranging the ideas," so to speak, may make the emergence of patterns and meanings possible. Finally, systematic exploration and manipulation demand an aggressive attack upon a problem which is almost certain to be more fruitful than less alert and active inspection. Many persons fail to solve problems either because they give up too soon or because they accept the first "hunch" or an early attempt which is either wrong or inadequate.

These considerations make it clear that if trial and error behavior takes the form of systematic variation of response, or of "trying this or that lead to the goal," it is something not to be disparaged, but encouraged. As exploration proceeds and successive attempts to respond adequately are made, the situation is more fully perceived, and the amount of trial and error behavior is correspondingly reduced.

How Responses Are Selected. During successive trials, how do selection of correct responses and elimination of incorrect reactions take place? The cue to the solution of this problem can be found in the following illustration. A certain wrestling coach, whose work with the "varsity" group left little time to train the freshman team, showed the first year squad a few "holds," and then told them to wrestle without supervision until he could return. Sometime later, he found that the freshmen had discovered several useful procedures in addition to the ones he had showed them earlier, and that they had also picked up certain acts which were undesirable but

which they continued to perform. The chances were also that in their unsupervised practice they had happened upon certain disadvantageous movements which they had eliminated, and had stumbled upon some serviceable acts which they had discarded as well. Why had they selected and retained both advantageous and disadvantageous responses? Why had they eliminated both serviceable and unprofitable performances?

The reasons probably are as follows: The wrestlers had selected advantageous responses because they recognized their desirable consequences, they had undoubtedly discarded other desirable acts because these responses had not produced results at the time, or their ultimate consequences were too remote to be recognized. The students had eliminated certain movements because these responses led to disastrous results. They had retained certain disadvantageous procedures because they had not discerned the relationship between these acts and the unfortunate situations to which they ultimately led.

Responses are selected, then, because of their consequences. During the varied reactions which individuals make to problem situations, certain performances may satisfy the motivating conditions which made adjustment necessary. Such responses tend to be selected and learned, and those which do not serve this function, or actually increase the tension, tend to drop out with successive trials. Looked at from another angle, we select and learn those responses which are instrumental to the attainment of goals and purposes.

THE LAW OF EFFECT

Thorndike has explained the selection and elimination of responses by the so-called "law of effect." According to this principle, responses that are accompanied by satisfying states of affairs (that is, those which the organism strives to attain or maintain) are selected and learned. Originally Thorndike included in the law the correlative conclusion that responses

whose aftereffects are annoying (states that the organism attempts to avoid or replace) are eliminated in the course of successive trials. His recent research, however, while it has confirmed the positive influence of satisfying consequences, has shown that annoyers do not weaken connections between situation and response, and are mainly useful in shifting the learner to some other response which may be correct and satisfying. "In all these experiments," Thorndike reports, "useful learning occurs almost or quite exclusively by strengthening of certain connections by satisfying after-effects" ³

Unfortunately, the law of effect has often been interpreted as referring to the influence of *affective concomitants* (feeling accompaniments) of a response rather than its *functional consequences*. Actually, human beings can tolerate considerable unpleasantness or annoyance as immediate aftereffects of responses if they know that these reactions are instrumental to the attainment of a highly valued goal. Recent research has demonstrated that learning sometimes can actually be facilitated by punishing correct reactions. Learning experiments have frequently employed electric shocks as punishments which supposedly induced annoying aftereffects. It has been discovered that in certain learning situations shocking the subjects when they made right responses was as efficacious as shocking them for the wrong ones ⁴ The reason these reactions were learned in spite of their apparently annoying aftereffects is that the subjects discovered that they were the right paths to the objective.⁵ If one is to agree that "a process of learning is modified definitely by the consequences incurred," one must interpret consequences to refer fundamentally to the relation of means and end.

LEARNING AS GOAL-DIRECTED ACTIVITY

Selection of Responses in Terms of the Goal. The principle that responses are selected and organized in terms of their relevance to the learner's goal has far-reaching implications for educational method. The fact that the development of

skill may be described as a series of successive approximations to a successful performance has already been pointed out. This statement indicates that if his practice is to be effective, the learner must have a clear picture of the successful performance, or a definite knowledge of the appropriate standards, *in advance*. *The first step in economical learning, in other words, is to establish the goal.* Then, after each attempt to execute the skilled behavior pattern, the learner must gauge the success of his performance by reference to the standard and *adapt his responses in the next trial in the light of this evaluation.* As he strives to make his activity conform more and more closely to the standard, the goal itself becomes more explicit, and this increased clarity, in turn, facilitates the proper modification of the subsequent responses.

Even after one has attained a high degree of skill in some activity, such as golf, his performance may go wrong. To diagnose the difficulty and eliminate the troublesome reactions, he must try to relate acts and consequences. Because it is often difficult to discern these means-consequence relations, the good golfer sometimes needs to have another capable observer identify them for him. Likewise, to improve his game, the player must discover and select those procedures which will lead to desirable ends; for this purpose, guidance or tuition of the right sort is also often essential.

Means-End Relations in Learning English. The field of English provides numerous illustrations of the significance of means-end relations in learning. Certainly, the first thing one must do before speaking or writing is to determine exactly what meanings he wishes to convey, what reactions he hopes to evoke from the audience. Then it is necessary to select the techniques of organization, presentation, and correctness necessary for the attainment of his purpose. If learning how to communicate ideas proceeds in this functional fashion, the student ultimately should acquire the ability deliberately and intelligently to choose the effective means for expressing his thoughts.

Vigorous, and sometimes acrimonious, debates are going on about the teaching of grammar. From the point of view of composition, the only reason for teaching grammar is to improve oral and written expression. Nevertheless, many teachers require students to learn the grammar of constructions in which persons very seldom if ever make errors. Evidence indicates also that it is extremely difficult to make a knowledge of grammar function in speaking and writing. Grammar, like any other phase of language, must be taught as a means of "clarity of thought and effectiveness of expression." When the emphasis is on conveying meaning, the student can easily correct the sentence: "I saw the house coming around the corner." An experimental study of the relative efficacy of a grammatical versus a *thought* approach to the improvement of sentence structure has shown, as a matter of fact, that it is unnecessary to require the student to learn the grammatical terms and principles involved in the correct placement of participial phrases like that in the sentence quoted above. The meaning the sentence intends to convey determines the placement of the modifier.⁶

Punctuation should also be approached as the means of clarifying the relations among written ideas so that the reader can sense the meaning correctly. In the sentences which follow, the "comma has changed the meaning and the meaning has changed the grammar:

Don't take that collar off Peter.

Don't take that collar off, Peter."

Here again, the means is determined by the end. When students find that commas are necessary to make meaning clear, they learn without great difficulty to use them intelligently.⁷

Outcomes Determine Teaching and Learning Activities. Just as the learner must have a definite goal in order to work effectively, the teacher must decide upon outcomes before he can determine what learning activities pupils should engage in. For example, different primary objectives for the study

of foreign language demand different teaching and learning procedures. If reading ability is chosen as the principal outcome, the conventional grammar-translation methods of teaching will prove relatively ineffective. The student should acquire his knowledge of vocabulary in the process of reading, and learn whatever grammar is necessary for adequate comprehension. Furthermore, for the purpose of reading, a recognition-knowledge of grammar will be sufficient. If the objective is to write the language, on the other hand, the much more hardily won ability to recall the necessary grammatical forms is essential.

The Learner's Role in Purposing. By substituting purposeful and meaningful activities for routine memorization and formal drill, the modern school has recognized that human beings learn those things which satisfy their needs and take them toward their goals. To act intelligently, one adapts means to ends. To learn energetically, one needs to desire these goals intensely. This is the reason why Dewey has declared that there is "no point in the philosophy of progressive education which is sounder than its emphasis upon the importance of the participation of the learner in the formation of the purposes which direct his activities in the learning process. . . ." ⁸ Dewey has also explained that the school has frequently failed to make children's tasks meaningful because it has neglected to make what is to be learned a means of realizing pupils' purposes. Schoolwork, to the pupil, is too often just a series of assigned tasks which call for "mechanical dexterity in applying set rules and manipulating symbols." Understanding comes, on the contrary, from discovering what information or what skills are necessary for attaining a desired end, or from determining the consequences or the uses or the implications of what is being learned.

INSIGHT

Learning Involves Insight. Discovering and using means-end relations is equivalent to gaining insight into the learning

situation as a whole. This view of learning makes it almost synonymous with thinking, or problem solving, and contrasts it sharply with stereotyped habit formation or the acquisition of specific associations. Simply stated, learning activities are insightful when they enable the individual to see into the situation, to understand it as a whole. In a problem situation, insight means the emergence of a complete solution. From another point of view, insight characterizes learning when the individual's behavior is fully organized with respect to the goal. Some writers have insisted that suddenness of appearance is an essential criterion of insight. Often solutions do occur suddenly; everything falls together into a coherent pattern, and, like a flash, the individual says, "Oh, I see!" Frequently, however, one can see only part of the way into the problem; perhaps the goal itself is still only vaguely defined. Certain relations in a complicated puzzle, for example, become apparent before all the pieces fit together. It seems reasonable, therefore, to speak of gradual or partial insight, perhaps even to recognize degrees of insight. The point to remember, however, is that learning is really complete or adequate only when the individual grasps the scheme of a solution or performance as a whole, when each phase of the total pattern fits in neatly, and the individual has apprehended the essential relations of all aspects of the situation.

Transfer as a Criterion of Insight. When behavior with respect to a problem is fully organized, one can proceed directly to the goal without incorrect responses or diffuse and awkward movements. Another criterion of the appearance of insight has been called transposability, which means that the essential principle of a solution can be recognized or applied in other particulars than those from which it originally was discovered. Experiments with children ranging in age from three to seven years demonstrated their ability to discover a principle in one problem situation and transfer it to comparable problems. In one of the studies, six toy airplanes were placed behind as many doors in a toy hangar.

The airplanes were all of one color, but each door was different in color. When the child pulled the door which matched the airplane in color, it opened and he secured the toy. Most of the children discovered this principle, and were able to apply it when the situation was changed so that each of the airplanes was a different color and the doors were the same color, and also when both airplanes and doors varied in color but one toy corresponded to one door. Form matching and size matching series also revealed the same sort of intelligent behavior. Furthermore, some of the children were able to carry the principle discovered in the first series over to the other two series, which were rather unlike situations.'

Insightful Learning in Arithmetic. The psychology of arithmetic provides many illustrations of the way in which pupils deal with new situations by using meaningful principles. The child who counts to find the answer to a simple number combination, or who uses other devious methods of solution, does so in an effort to find meaning in the situation. When a child solves 24 plus 24 by saying "25 and 25 are 50, less 2 is 48," he is making an intelligent use of his previous learning. Many textbooks have taught three cases of percentage corresponding to these situations: What is 10 per cent of 100? What per cent of 100 is 10? Ten is 10 per cent of what number? If the pupil really understands the underlying number relationships in percentage, he will be able to handle specific problems whether they occur in one "case" or the other.

Recent trends in the theory of learning, together with new experimental evidence, have begun to change methods of teaching arithmetic radically. Much instruction in arithmetic has proceeded on the assumption that time spent in understanding arithmetical processes is wasteful, and that the procedures might better just be memorized. How influential this doctrine has been is shown by a very recent admonition that "it might be more economical first to teach the child to memorize the combinations and later develop the number

concepts." However, the evidence is beginning to run in a diametrically opposite direction. Brownell has reported evidence that habituation (memorization) of the number facts does not occur until the child has found meaning for them.¹⁰ In another investigation, one large group of second grade children learned the addition and subtraction combinations by procedures that emphasized discovery, organization of related facts, and understanding of general principles. A comparable group were always told the answers, never permitted to discover them for themselves. The combinations were always practiced in mixed order, and large amounts of specific drill were administered. The experiment lasted approximately eight months. During this period three tests of transfer of learning to untaught processes were administered, and a fourth was included in the final test battery. The differences on all four tests consistently favored the group that had used meaningful procedures.¹¹

A still more recent experiment compared the learning of the 100 addition facts by the methods of specific repetition and meaningful generalization. When given a transfer test composed of thirty addition examples each of which contained one addend larger than ten, the pupils who had used the method of meaningful generalization were markedly superior to those who had learned by sheer repetition of the specific facts. The author of the investigation concluded that his evidence supported "the faith of those who would make arithmetic less a challenge to the pupil's memory and more a challenge to his intelligence."¹²

There may be some things that we have to learn almost by rote. But the school should hold such tasks to the absolute minimum and place its emphasis upon rational learning. Education should call for the exercise of intelligence. Instruction should lead the child to understand; practice for the development of precision in response must wait upon adequate insight into the task or performance as a whole. The school must encourage active discovery rather than the habituation

of authoritatively identified connections. Learning activities should culminate in products that are not "specific facts" but meaningful generalizations which can be applied to a large number of appropriate particular situations. For example, common fractions, decimal fractions, and percentage should be taught not as independent processes which can be manipulated by certain rules that govern the manner in which they can be changed back and forth, but as different expressions of the same idea. Educational methods must emphasize the organization of responses into highly coherent systems of ideas and smoothly coordinated acts.

ORGANIZATION IN LEARNING

Learning Is a Change in Behavioral Organization.

Implicit in the definition of learning as adjustment or adaptation, which was the position taken at the beginning of this chapter, is the idea that it is the organism as a whole which learns. When the individual learns new patterns of behavior as a means of attaining his goals, he changes as a *person*. Learning is not the acquisition of items of information or skill, or of a multitude of discrete reactions, but is a change in the *organization* of behavior which gives the organism more effective control over the conditions of experience. One of the most important corollaries of this principle is the fact that different "kinds" of learning take place concomitantly. Bode has recently explained how thinking, appreciation, skill, and information, for example, are interrelated in learning activities:

Thinking has to do with the removal of obstacles, and this involves an element of concern or value, else why take the trouble to think at all? The successful culmination of thinking has an attendant esthetic quality, as when we speak in mathematics of a 'beautiful demonstration.' Thinking, moreover, involves the gathering of data for the testing of hypotheses, which in turn is related both to the acquisition of information and to the development of skills or techniques in observation, in analysis, and in the organization of material. . . . Learning as reconstruction combines thinking,

skill, information, and appreciation in a single unitary process, and it is characterized by flexibility, since it must constantly adapt itself to the circumstances of the situation.¹³

Interrelatedness of Learning Products. Many other illustrations of the interrelationships of learning outcomes can be found. As the child learns arithmetic he may be acquiring self-dependence or learning the habit of leaning on others. The classroom may smother interests or stimulate new and enriching ones. The recitation may stimulate rigorous thinking or encourage the expression of half-baked ideas. School experience may promote self-confidence or foster timidity and inferiority. The whole of the child's school life may give him a warm sense of personal worth or deflate his ego. Teachers should remember that they are always dealing with the pupil as a person, never with just a piece of him at a time.

We React to Stimulus Patterns. The fact that organization is a primary aspect of experience is revealed in the ability of the organism to react to relations among stimulus objects. Animals, as well as human beings, perceive relations. For example, animals have been taught to find food in connection with the brighter of two stimuli, when A is brighter than B. Then B is removed, and C, which is now brighter than A, is substituted for B. The animal then looks for food at C. In other words, he has not learned to respond to A specifically, in the first instance, but to the relative brightness of A and B.

One of the most interesting experiments in the perception of relations by human subjects was a study in equivalent stimulation.¹⁴ The general design was to vary the details of stimulation, but to keep the general pattern in the situations constant. The different experiments involved the use of the following materials: (1) a complex pencil maze, in which variations were secured by printing the maze in different scales; (2) a difficult number maze, in which all the numbers on the sheet were changed by certain sums in the several variations; (3) a series of ten simple melodies, variations in

which were secured by changing the key, and (4) a series of eight rhythms, in which the variations were made by presenting the rhythms in sounds of different quality.

This group of experiments demonstrated that when stimuli are varied within certain rather wide limits as far as their absolute characteristics are concerned, the learning process is not retarded if the internal configuration of the stimuli remains constant. They also revealed another fundamental characteristic of learning, namely, that what one learns is not a loosely connected series of specific reactions, but a highly patterned, or organized, response. Consider the results with the pencil maze, for example. The group which practiced with a maze of the same pattern but of different size on each repetition learned as rapidly as the subjects who practiced constantly with mazes identical in both size and pattern. In the first instance, the subjects could not have practiced the same movements each time. They learned, not a chain of highly specific reactions, but an organized response pattern in which the details were subordinate to the general configuration.

DIFFERENTIATION AND INTEGRATION

Learning as Differentiation. Learning often proceeds by the process of noting details in a situation which has previously been experienced in its more general form or outline. This is the process of differentiation. When one approaches a city from a distance, for instance, he usually sees the sky line as a relatively undifferentiated whole — he perceives its general outline but is unable to distinguish the forms of specific buildings. As he comes nearer, however, and observes carefully, the outlines of particular buildings begin to appear. The phenomenon of differentiation of specific details is also evident in the way the child acquires number concepts. Contrary to popular assumptions, the number idea does not begin with counting. The child's first differentiation of a group of objects meaning *many* is not into a series of ones, but into

more or less unequal subgroups. The child does not need to count to comprehend the meaning of *more* or *less*. The idea of *equal* is somewhat more difficult, but can also be grasped without counting. The cardinal (quantity) and ordinal (series) concepts of number emerge together. Counting accompanies this process as a relatively *late* process of differentiation.¹⁵

Differentiation a Highly Important Process. Responding to wholes only, without distinguishing details and their relations, has very limited value in experience. In learning to read, for instance, some words may be distinguished from one another by their general outlines. This form of recognition has limited usefulness, however, for different words may have essentially similar configurations. Discrimination, therefore, depends upon noting the detailed characteristics and differences in words.

Necessities of adjustment determine the extent to which differentiation occurs. The necessity for directing energy upon specific objects, or at specific points — hitting a golf ball, for example — causes a narrowing and specificity of response. Likewise, certain aspects of the stimulus field, rather than the original whole, are sorted out as the critical occasions for the response. Differentiation occurs, therefore, both in perceiving the situation and in reacting to it.

Learning as Integration. Learning, of course, is more than a process of differentiation. It is one of integration and reorganization as well. Details may emerge from larger wholes and ultimately acquire such a degree of individuality or specificity that they may be combined with other particulars and reorganized into a coherent pattern. Many of our acts of skill involve the utilization of responses that have already been formed in other contexts. The growth of concepts or ideas, though often necessitating a reduction in the number of particulars to which a class name applies, in other instances involves the inclusion of additional concrete items under a given verbal symbol. Integration, or reorganization of

experience, occurs when we discover the relations among things that we have originally learned at different times and in different contexts. For example, we may extend and enrich our knowledge of human behavior by relevant information from many subjects — psychology, biology, social science, and literature, to mention only a few sources. Educational procedures should stimulate and facilitate one's ability to systematize, to integrate or unify the multitude of things which he learns. Purposive educational experiences which call for problem solving are the ones which are most likely to evoke the continuous utilization and progressive reorganization of previous learnings.

Integration Not a Process of Summing. It is important to understand that integration does not take place through mere accretion, it is not an additive process. An integrated whole is not just a collection of parts or elements; any organized process, rather, is more than, or, perhaps, different from, the sum of its parts. When acts or ideas are combined in a new way, the parts lose something of their individuality in becoming the members of a new pattern of behavior. In other words, it is not the part itself that is most important, but the relations it has with the other members. An understanding of modern economic problems, for example, involves a clear recognition of the interdependence of agricultural, labor, and industrial policies.

Differentiation and Integration Are Correlative Processes. Differentiation and integration are not independent processes; both phases of growth contribute in interrelated fashion to the development of behavior. Both processes, furthermore, operate throughout the individual's history. Even the mature individual frequently reacts first to the generalized characteristics of situations and then discriminates their more specific phases. For example, he may not notice for some time that there is a difference in number and arrangement of needles on the pine trees around his summer cottage. Then, when he has noted these details, he may combine them

with other characteristics as a means of distinguishing one kind of pine from another.

Organization Determines Association. During investigations of integrative forms of learning, Thorndike found that mere contiguity was insufficient to explain in every case how things became related. He decided that some sort of "belonging" or "fitness" was necessary for a complete explanation of learning. He pointed out that unless the individual senses that there is some relation between two situations, he may experience them in sequence repeatedly without forming any association between them. It has been suggested that this "belonging" arises when two or more events are members of some more inclusive scheme or pattern, and that the relations among these situations are determined by the larger whole. For example, in the series, 2, 4, 6, 8, 10, the association between 4 and 6 is dependent upon the scheme or principle with which the series is constructed. This belonging is obviously not due to contiguity alone, but is a product of the intrinsic relationships among the numbers. It is in this sense that it has been said that association is a product of organization. Situations get their belonging from their membership in a coherent pattern of events or behavior.

THE IMPORTANCE OF RELATIONSHIPS

Relatedness has become the central concept in the psychology of learning. We have already emphasized that meaningful learning in arithmetic, for example, makes it possible for children to understand our decimal number system and the ways of manipulating it. This system provides the basic pattern for understanding and relating the multitude of specific items which are included in it and controlled by it. The decimal nature of the number system is the basis for an understanding of the idea of place value, and the means of changing ones to tens, tens to hundreds, or hundreds to tens, tens to ones, and so forth. This scheme is the basis for understanding the processes of addition and subtraction, as well as other

operations. It is probable that many of the errors that children make in arithmetic are due to the fact that "skills" have been taught as specific and discrete elements rather than as related processes, and learned as mechanical operations rather than as understandable and logical aspects of systematic mathematical thinking.

Likewise, it is possible to teach and learn history as a collection of specific facts, or to organize events into meaningful patterns and developments. For instance, one can treat the New Deal as a series of relatively isolated events in our history, or as another episode in the clash of interest groups which has been taking place since the beginning of our national life. It is by placing specific items in a broader pattern of relationships that we invest them with meaning.

Schools and colleges have devised new forms of curriculum organization in recent years in an effort to restore unity or relatedness in the curriculum. Elementary and secondary schools have experimented with activity programs, "experience" curricula, broad-field sequences, and other forms of unified courses. Higher institutions have organized survey and orientation courses. Many of these attempts to integrate or correlate the materials of instruction have undoubtedly facilitated the organization of experience and behavior, but it is essential to remember that "Organisms actively *create* mental unification in themselves; they do not simply absorb such a condition as a completed product."¹⁶

SUMMARY

Learning situations vary greatly in the amount of discovery of the correct response which is necessary for solution and also in the difficulty with which the appropriate reactions are determined. Relatively easy problems which are well within the learner's experience may be solved very quickly. The essential relationships in the situation can be perceived easily, and the appropriate behavior is organized directly and effectively to conform to the structure of the task.

In other instances, however, the task may be much more complicated, so that a great many trials may be necessary before the situation is thoroughly structured and the proper responses discovered. These successive trials, or attempts at solution, are not random, however, even in very difficult situations. The individual's first efforts are guided by his preliminary inspection of the task, even though the goal is not very clearly perceived at that moment. This perception of the nature of the situation, even though very incomplete, is usually sufficient to evoke somewhat relevant reactions which are within the learner's repertoire of experience. The early trials in a complex situation often serve an exploratory function. They aid in seeing the goal more clearly and explicitly and in getting some notion of the means which may be necessary to attain it. This increased knowledge of the goal in turn tends to make the attempts to reach it more and more successful, until, finally, the diffuse behavior and the errors which characterized the early trials drop out and give way to the appropriate responses which are organized in such fashion that the performance is done directly and efficiently. This process of progressive approximation to the final successful response pattern has been described as that of "trying this or that lead to the goal," or of discovering the right path to the objective. It has also been aptly characterized as learning by "approximation and correction" ¹⁷

The process of approximation and correction is that of evaluating each attempt at performance or solution by gauging the success of the response in relation to the objective, and by adapting the next trial in the light of this appraisal. In other words, the learning process is characterized by the discovery and utilization of means-end relations.

Behavior is modified by its consequences. This means, essentially, that responses which do nothing to further the progress of the learner toward his objective or actually impede his attainment tend to be eliminated, and those which are instrumental in achieving his goal are selected and learned.

Learning will be effective, therefore, to the extent to which the individual perceives the essential means-end relations. The comprehension of means-consequence patterns is often called insight.

Insight frequently takes the form of "hindsight" rather than "foresight." That is, although the learner may devise the means of attaining his goal by direct invention of relevant activities, progress most often occurs, probably, by observing the usefulness of an act — its relation to the goal — after it has happened. This is one reason why a varied and persistent attack upon a problem is essential. Such a range of trials gives greater opportunity for a possibly fruitful response to occur and to be recognized.

If insight means a complete solution of a problem — a comprehension of the essential relationships in the situation as a whole — it is clear that it may occur suddenly in a relatively simple task, or wait upon a systematic exploration which may be necessary to throw the essential features of the situation into bold relief, or be attained very gradually in a complex problem. But even when the principle of a problem has been discovered, the attainment of precision, the fixation or stabilization of the correct solution, may have to be secured by a considerable amount of further practice.

The structuring of a situation as a means of attaining control over it takes form in two interrelated ways. One of these is the process of differentiation, in which the details or specific features of a more general or comprehensive pattern take form. These particular aspects of experience emerge under the control of the larger wholes of which they are members. The significance that any one thing has by virtue of its relationships should not be obscured. Nevertheless, these specific characteristics may attain such a degree of individuality that they may be removed from their original setting and combined with other particulars to form a new behavior pattern. This is known as integration, which is the second way in which the reorganization of behavior occurs. Differentiation and inte-

gration are not independent processes. Both are involved in most of our learning activities

The most significant feature of learning behavior is organization. An act of skill, as we shall see in the next chapter, is a highly integrated performance, in which no one component acts independently but must fit neatly into the entire pattern of movement. Likewise, the most important thing about ideas is their interdependence. The uses and the consequences of ideas, for example, are among their most important relationships. Associations among experiences are the product of the patterns in which these experiences occurred or of the new relationships into which they may be reorganized.

From a rapidly growing volume of research on human learning, an increasing amount of it done with children under normal school conditions, the outlines of a constructive view of learning, sharply set off from practices which relied upon formal drill, are taking form. This point of view emphasizes relatedness rather than itemization. It stresses meaningful generalization instead of extreme specificity. It conceives of learning as a meaningful process. It considers understanding more important than mere repetition. It looks upon learning as a developmental process, not one of fixation of stereotyped reactions. It encourages discovery and problem solving instead of rote learning and parrotlike repetition.

QUESTIONS AND EXERCISES

1. In what ways does rote learning in a laboratory situation differ from the learning children are required to do in a social studies project?
2. Give an example of "trial and error" behavior from your own recent experience — possibly the search for a lost article. List each step of your search. To what extent were your activities random? Were some more relevant to the situation than others? Which ones? Compare the phases of your search with those practiced by the usual six year old.
3. In the outline of the learning process there was listed a stage entitled "selection or least action appears." How do you interpret this?

4. Give an example from your own experience or from that of a friend of the correction of an habitually incorrect grammatical expression in everyday speech. How did you first recognize your bad habit? Did you realize it violated a grammatical law? Describe each step in your improvement. At what age do you think self-correction by grammatical rule is possible?
5. A college student in a required laboratory science course said to the professor, "I can't do any of the arithmetic in my experiments because I went to a progressive school." Interpret this situation in the light of the quotation from John Dewey in this chapter. What solution do you offer?
6. It has been said that thinking or learning occurs only when the individual encounters an obstacle. Can you develop this notion more fully? What implication does this have for the role of motivation?
7. Give instances of teaching children in school or at home in which the law of effect is ineffectively used or neglected or cases in which bad impulses are actually rewarded.
8. Under what circumstances may events be experienced simultaneously without resulting in associative learning? The following are two examples. Noting the names of various vessels in the U. S. navy, and seeing the "tailing-off" design on top of chocolate bonbons. Give another example. Show how "belongingness" may develop in the above situations.
9. Cite one case in which the immediate "affective concomitants" may be unpleasant, but the law of effect operates because of the "functional consequences."
10. Describe three instances in which children's learning was facilitated by "insight." Did the "insight" emerge suddenly or gradually? Explain.
11. Defend or criticize this statement: "The law of effect is the most important law of learning."
12. Give an example of learning in which the process is predominantly differentiation. Give an example of learning in which the process is predominantly integration.
13. Is it possible for an irrelevant feature to become associated with a successful response and thereafter always function with that response in the course of learning? Cite an instance.
14. There is an amusing map, "The New Yorker's Idea of the United States," in which New York (especially New York City) occupies about a quarter of the total geographical area and all southern waterways are labeled "Swanee River." What process of learning, as described in this chapter, will have to take place

- before Mr New Yorker will have a more accurate notion of the country? Suggest the necessary course of such learning.
15. In what ways would it help you in teaching junior high school pupils to know about the law of effect? How would you apply the principle?
 16. What knowledge do you think it may always be necessary for children to acquire by rote learning?
 17. Write two essay questions on the material of this chapter which would serve as an aid to further learning during the final examination
 18. Make a diagram to show the essential features of a learning situation in which a means to a goal is to be selected. Name several situations which your diagram might represent

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- Melton, A. W., "Learning," *Encyclopedia of Educational Research*, Macmillan, 1941, 667-686

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Thorndike, E. L., *The Psychology of Wants, Interests, and Attitudes*, Appleton, 1935, especially Ch. 3, 4, 6, 11

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CHAPTER XI

Principles of Guidance in Learning — I

An outline of the general nature of learning, to which the two preceding chapters were devoted, is sufficient to emphasize the fact that successive efforts to learn may vary greatly in their effectiveness. There are important principles of economy related to such critical factors as the selective and directive effect of motives, particularly the influence of clearly perceived goals, the discernment of means-end relations, and the meaningful organization of experience. By controlling motivation, by aiding the learner to evaluate his trials, by applying rewards and punishments judiciously, by arranging the length and distribution of practice periods in optimum fashion, by assisting the learner to adopt a scheme of organization, by giving instruction concerning useful methods of procedure, and by other types of supervision, it is possible to guide the individual's efforts toward successful results. Moreover, by making the student aware of efficient methods of learning, one gives him the means of managing his learning independently. This chapter and the one following will be devoted to the principles of guiding and managing learning successfully.

The principles of economy will be discussed with reference to two phases of learning:

1. The acquisition of skill.
2. The acquisition of powers which depend primarily upon verbal abilities or other symbolic processes.

This division is made merely for convenience in discussion. These two phases of learning are often closely interrelated. For example, in learning to read one must take care of the formation of proper motor reactions which are highly complex habits of eye control; and of the acquisition of ideas, that is, of comprehension or thought-getting. Furthermore, the principles of efficiency are essentially the same for both motor and ideational learning. This fact of fundamental unity within the learning process will become apparent as the problems of guidance are treated.

PRINCIPLES OF GUIDANCE IN THE ACQUISITION OF SKILL

Evidence that Guidance Is Desirable. We need only to point to the "hunt-and-peck" methods of typewriting, the pointing-with-the-finger habit in reading, the cramped grip in writing, or the "dog-paddle" strokes in swimming to convince most people of the inadequacies of unguided learning. By teaching and guiding the learner to acquire the "touch system" in typing, regular eye movements in reading, the positions and functions of the fingers in writing, or the "crawl" stroke in swimming, much higher proficiency is achieved. The learner left to himself usually adopts the first method he stumbles upon, a method that is rarely good. The effective methods often are more difficult in the early stages. Immediate returns are often meager, and, in general, the unguided learner seeks immediate progress; he follows the line of least resistance. Not only, then, is it the business of the instructor to know what the child should learn but also how he should learn.

Know the Character of Effective Performance. The first requirement of an instructor, or of a person managing his own learning, is to know the character of the good performance. To determine this is often difficult and may be done only by extensive research.

The way in which modern methods of teaching reading grew out of experimental investigations is a good illustration.

Three discoveries made at different times between 1879 and 1910 are the fundamental, but not the only, bases upon which modern methods rest. One was the discovery that the eye, in reading, moves along the line by a series of starts and stops, the second, that the eye while at rest can take in briefly about an inch and a half of a line of print held at the ordinary reading distance; and the third, that one need not see distinctly all of the letters, or even all of the words, in an "eyeful" to recognize the group of words. These discoveries led to new methods in which were emphasized learning to recognize words as total configurations instead of letter by letter, learning to read by getting meaning directly from perception of the symbols without the intervention of oral reading or complete articulation of the words, and learning to utilize rapid and rhythmic eye-movement progressions along the line. Shifting from the old to the newer procedures has enabled both young and mature readers to improve the thoroughness of comprehension and to increase greatly the rate of reading.

The psychology of reading also provides an illustration of learning activities in which the motor and ideational phases are closely interrelated. In the early stages of learning to read, it is essential for the child to develop the habit of working systematically from left to right in reading lines of printed words, and in dealing with new words, to acquire the habit of studying them from left to right, "to swing back clearly from end to beginning, and to proceed again from left to right" ¹ Failure to acquire these systematic habits of dextral progression may cause difficulty in learning to read. Looking at a word from right to left, for example, may cause reversals, such as the reading of "was" for "saw." It is important, therefore, for the teacher to guide the development of correct eye movements from the beginning of reading instruction. Once these basic motor or procedural adaptations have been established, however, eye movements may best be interpreted not as causes, but as symptoms of reading ability or disability. In other words, at later stages of learning, eye movements

merely reflect efficient or poor performance in reading. Recent interpretations of the nature of reading refer to eye movements as "peripheral measures" of reading efficiency, the most important phase of which is comprehension, a "central ability or function." Thus the thought processes of reading tend to determine the motor phases of the activity.²

The combined arm-and-hand movement method in handwriting, the "touch" system in typewriting, the "crawl" stroke in swimming, are other results of investigations, either crude or refined, of the relative merit of different types of performances. While much remains to be learned concerning different methods even in the simpler school skills, such as writing and drawing, a teacher of these subjects should at least have the available information about the relative merits of different types of performance.

The Observation of Performances and Models. Having ascertained the nature of effective performance, how is it to be learned? We have already described learning as a series of progressive approximations to some standard or criterion of successful performance. The first principle of guidance, therefore, is to make certain that the learner has a clear understanding of the goal. It is the goal which determines the organization of the performance as a whole. As learning proceeds, the goal and the means of attaining it become more explicit. With this developing insight into the nature of the task, there is a corresponding improvement in the precision with which the act is executed.

One of the most effective means of aiding the learner to perceive the goal clearly is to take advantage of the human capacity to profit by observation of a performance or model. Choice here is determined entirely by the clearness with which the performance or the model illustrates what is to be done. Despite the large number of functions in which learning is more or less guided by our observations of others in action, most of the motor activities in common skills are exceedingly difficult to perceive. Inasmuch as he does not always know

just what to look for or where or how to look, the learner often profits little by observing an expert typist, tennis player, golfer, or singer. The child especially finds difficulty in seeing how the teacher writes, dances, or ties a knot. To referee — that is, to observe skillfully — a boxing contest or wrestling match, to umpire a baseball game, or judge a diving or dancing contest is a fine art requiring years of experience. Were finer movements not difficult to perceive, the sleight-of-hand performer would have failed long ago. *Learning by observation is difficult.* It is brought about in no mysterious, instinctive, or intuitive way; it is effective only insofar as the learner is able to perceive what the desirable reactions are and is then able to guide his efforts accordingly.

The skillful instructor should be a good actor, able to single out a particular movement and perform it alone when necessary, and able to slow up a movement to afford more deliberate observation. The use of diagrams, mechanical devices, and slow-motion pictures often make clear the pattern and details of a performance more adequately than the observation of the original. The essential criterion for the choice of a model for purposes of guidance is the faithfulness and clearness with which it displays the ends sought. Other things being equal, that model is best which makes the desired reactions most intelligible and provides the most effective means of discovering relationships and of distinguishing errors and successes.

Manual Guidance. In addition to the observation of movements and models, another form of tuition that has attained popularity from time to time consists in putting the learner mechanically through the performance or at least in providing some mechanical guide which enables him easily to put himself through. In writing, for example, this might be done by guiding the child's hand through the letter movements or by providing letters grooved in wood or metal through which the child pushes his pencil, or by allowing him to follow with his finger the sandpaper outlines of letters, or

to trace on tissue paper the forms of letters visible through it. There are two ways in which putting the learner through the reaction or mechanically guiding his progress might, conceivably, be of value:

1. By providing a clear idea of what is to be done.
2. By giving the mechanisms involved artificial exercise in the way they should function.

At first thought, this device would appear to provide a simple way of eliminating errors and circumventing the usual "trial and error" behavior

Some Studies of Manual Guidance in Learning to Write.

What seemed, theoretically, to be the best of these devices, the tracing of letters on tissue paper placed over letter forms that were clearly visible through the paper, has been tested experimentally (Gates and Taylor).³ Two squads of children with about equal intelligence and motor ability but without previous experience in writing were selected. One squad practiced daily the tracing as described, while the other practiced actual writing, using a model placed above the writing page. After about a month of daily practice on ten different letters, both groups were tested for several days in real writing, using only the model as guide. Some were almost completely baffled. They were familiar with the shapes of the letters, knew at what points to start and in what direction to proceed, but for them writing a letter on a blank page was a very different performance from tracing a form which showed itself through a thin paper. Some of them simply could not produce a legible letter; their consternation and chagrin were pathetic. Apparently, even though a person may know what product he wishes to produce, most of his efforts may lead astray.

Direct practice in writing, in this experiment, was more effective than tracing. Likewise, in a study (by O. E. Hertzberg)⁴ it was found that direct practice was more effective than putting the child through the reactions by means of

mechanical guides. Knowledge of what to do, where to start, etc., were obtained better by direct writing

A survey of investigations in manual guidance shows that the results are by no means consistent. In certain studies, the beneficial effects of guidance were not equal to those from the same number of unguided trials. In other instances, however, manual assistance was definitely beneficial when the criteria were number of trials necessary for learning and the number of errors made during the process. One of the most important investigations was conducted to determine the relative efficacy of free and manually guided maze learning when equated in terms of time. The results favored guided learning, particularly when retention was measured.⁵ In instances where guidance proved effective, it was interpolated early in the practice series, or given initially.

Manual guidance is likely to be effective only when it aids the learner to get the "feel" of the act as a whole — not in some artificial form or setting, but in terms of a realistic performance. It is this "feeling" which constitutes the basic organization, or schema, of the activity, within which refinement of the movements will occur as the specific phases of the performance become more nicely fitted into their proper relations. Giving guidance in the early stages of learning aids in the establishment of the initially integrated response which is essential for the economical acquisition of skilled movements.

Learning the Act as a Whole. There is a popular conception that an act of skill should be analyzed into its elements and part movements, and that each of these segments should be learned singly. For example, in swimming the learner may grasp the edge of the tank and practice singly some part or the whole of the leg movement; in singing he may repeatedly do certain limited exercises; in athletics "formal" setting-up exercises may be extensively used; in writing, many methods have elaborate systems of particular exercises such as repeated making of up and down marks, ovals and reverse ovals, swings, and loops. The theoretical basis of such formal exercises is

the notion that to master the whole one must master the parts, that if one learns to do singly all of the elemental acts in a complex function, putting the single acts together will be relatively easy.

This theory is quite erroneous. Learning to do the parts singly is by no means learning to do the whole. The greatest difficulties are often encountered in putting the elements together. Moreover, the elements are often already sufficiently developed without the preliminary practice; *if not, they are usually more economically perfected in practicing the whole.* Those which do not develop sufficiently while practicing the whole may well be handled singly later, but not until it becomes necessary. We should not begin with *elaborate* formal exercise of the elements or make them a large part of the course of training but should utilize them as strictly preventive measures where difficulty is beginning to appear or as remedial measures where a particular defect or deficiency is apparent. When thus singled out for specific treatment, a particular aspect of a total performance has a significance and character it could not have as an isolated segment practiced without respect to its membership relations.

The value of learning a thing as nearly as possible in the setting in which it is eventually to be done is illustrated in an experimental comparison of two methods of learning type-writing. One group was taught by the "comprehensive process of beginning and continuing the practice on complete composition material that is most like that which the typist will be required to use [in practical work]," and a comparable group used a "synthetic process of beginning with isolated and meaningless letter-symbol combinations and gradually going from these to the more simple words, phrases, and sentences, and finally to the use of the business letter and other composition forms." The group which used the comprehensive units was significantly superior in final score and average number of letters written per practice period.⁶

The organization of a skilled performance, of course, often

involves the utilization, in new relationships, of previously acquired movements. But these so-called elements do not fit together in additive fashion to constitute the completed act. It is the *pattern* of these particulars which is the prepotent characteristic of their successful functioning.

Overemphasis on any one phase of an act usually destroys its balance and effectiveness. For example, if the golfer makes some change in his movements after the downswing of the drive has begun, the whole performance is distorted and the stroke goes wrong. A change in any part causes a change in the act as a whole. In an act of skill, as in any other complex aspect of behavior, the most significant characteristic is that of organization. The whole determines the nature of the parts. Once the fundamental pattern of action is established, the parts or specific movements tend to fit together in proper relation. A shift in organization forces a corresponding readjustment in the details of performance. The prepotence of organization in skill is suggested by such terms as "rhythm," "timing," and "feel of the act." In playing golf, if the "feel" of a stroke is right, one expects the ball to go according to plan. If the "feel" is wrong, one knows before he looks after the ball that he has muffed the shot.

ESSENTIALS FOR CONTINUED IMPROVEMENT OF SKILL

Flexibility in Skilled Performance. Skill must not be confused with a stereotyped or inflexible reaction pattern. No one performs an act of skill twice in exactly the same fashion. With subtle changes in the situation, there must be corresponding adjustments in the pattern of responses necessary to reach the goal. One adjusts his writing movements to the height and size of the desk. The golfer must adapt his strokes to the thickness of the turf, to the contour of the ground where the ball lies, to the depth to which the ball has burrowed into the sand trap, to the nature of the hazard, and to a thousand other changing conditions of the game. The runner

compensates for the condition of the track. The singer adjusts his technique to the meaning of each composition. Because of the inevitable necessity of compensation, it would be unwise to have the learner practice always under exactly the same conditions requiring invariable movements. The cues to successful performance under varying conditions are an explicit perception of the goal and the intelligent adaptation of means to end.

Discovery of Correct and Incorrect Responses. Since learning proceeds through the identification and utilization of means-end relations, one of the most important guidance techniques is assisting the learner to determine the consequences, or the appropriateness or inappropriateness, of his reactions. Devices which help the identification and elimination of errors, unless they introduce other inappropriate reactions equally bad, are much to be desired. In the subtle elements of writing, speech, reading, tennis, and other skills, the instructor has the double duty of being constantly on the alert for errors, usual and unusual, and of instructing the learner in the ways of detecting and eliminating his own inappropriate acts. Prevention is, of course, better than cure. Prevention may be secured to a considerable extent by giving very diligent attention to the initial stages of learning. In studies of children's first lessons in reading, it was found (by Meek)⁷ that inappropriate methods of attack, hit upon in the first endeavor to learn, may be so persistent as to make later progress difficult and the work distasteful. Such difficulties may mark the beginning of "disabilities" in reading. The cases of "disability" — children who are persistently very backward and experience extreme difficulty in learning — may be brought back to efficiency only by ingenious or extreme measures later. The procedure for treating such cases comprises the following essential steps:

1. Diagnosing the particular defects or deficiency responsible for the trouble. This is often an intricate task, demanding considerable insight into the particular skill as well as an understanding of human nature.

2. Making clear to the learner the sources of the trouble.
3. By encouragement or other devices arousing a strong desire to overcome the difficulties and to achieve normal ability.
4. Providing remedial exercises designed specifically to supplant the inappropriate reactions by effective ones.

Although it is important to detect and eliminate inefficient or incorrect responses, it is even more essential to disclose the correct reactions and reveal their relations to other phases of the performance and to the goal. Above almost everything else, knowledge that progress in the right direction is being made is a stimulant to further successes. In this work, as indeed at all stages of learning, the instructor or coach should constantly be on the alert for the recurrence of old or the appearance of new errors. They should be detected before they become fixed, and the proper response suggested. When an error is once eliminated, it should not be mentioned again. Emphasis should, then, in general be placed on the correct reaction; but the incorrect response should never be ignored.

The learner himself should be trained to detect his errors and successes. It is quite clear in observations even of adults in laboratory studies that most students are unnecessarily poor learners, unnecessarily blind to their errors and successes. These deficiencies are due partly to the scant attention usually given to methods of learning. With a little attention to technique, most of us can become more systematic and more alert to our own reactions, and thus increase appreciably our ability to learn in each line. In learning to make public addresses, sing, etc., the recording of the voice, which is later critically studied, usually aids greatly the process of learning. In other types of learning, photographic and other records may be fruitfully used.

The Directing of Attention. In connection with these suggestions concerning the value of directing attention to and discovering errors, an erroneous theory of the value of concentration on the sensations which arise from the activities

of the muscles, tendons, and joints merits a word. This theory assumes that if one is attending to the sensations from the organs of response when a good reaction happens to be made, he may later reinstate the response by calling to mind the complex of sensations.

However, ask a golfer what ideas he tries to activate before making a stroke. He will not say that he tries to recall the hundreds of sensations from the body that he previously experienced during the process of making a good stroke. He could not possibly do so if he tried. His ideas may be thoughts of cautions such as: "Now, don't get excited," or "Take your time," or "Keep your eye on the ball." As for the expert, the less he thinks about the sensations arising from a good stroke, the better. He simply makes the preparatory reactions — adjusts his feet, bends his knee, places the club, and goes through with the stroke with no thought of the movements whatsoever.

The whole notion that a learner profits by attending to the sensations from the members employed in a complex act is erroneous. Attention should be directed to

1. The features which assist in securing the correct preliminary orientation.
2. Features which help in detecting errors or successes in the act
3. The general outcome of the act.

If one is trying to throw a baseball over the plate, he must first observe and thereby locate the plate. When the movement is under way it is wise to look at the plate, although at times — in practice — it pays to give attention to some part of the process that is troublesome. Thus, the pitcher may be stepping out too far; an error which he must detect and remedy. He should know both when his moves are incorrectly and when they are properly performed. As soon as he gets the act going right it is better to think about it no longer. The other feature which deserves attention is the outcome

of the total act: the pitcher should try to observe accurately just where the ball went, and try to account both for successes and errors.

The same principles hold for other forms of motor activities. In writing, drawing, carving, diving, turning handsprings, and so on, the learner must first get the correct position and, second, keep on the lookout for good and bad movements by watching the product, trying at the same time to detect the causes of errors and successes. As he masters the act, the conscious reactions gradually drop out because they are unnecessary.

Precision. Progressive change in performance characterizes the acquisition of skill. The final proficiency is not merely the performance at the beginning done more rapidly; it is a different performance. Behind the gradual decrease in time necessary to execute the act and in number of errors made, other significant changes are occurring. There is a reduction in the muscular tension which frequently accompanies initial trials. There is elimination of surplus movements. Better preliminary orientation is attained as practice continues. With awareness of progress, greater interest in improvement may intensify effort, a more favorable attitude toward the task may develop, and greater self-confidence may be aroused. Greater insight into the task usually emerges, which leads to greater ability to identify true sources of improvement. Finally, at later stages in practice, the pattern as a whole tends to become much more clean-cut, and, through attention to relevant details, the performance takes on much greater refinement or precision.⁸ Precision is thus a relatively late development in the acquisition of skill. It takes the form of greater smoothness, economy, stability, rhythm, speed, and exactness. These refinements take place under the control of the basic schema or pattern which is the objective of the earlier stages of practice, during which form and accuracy rather than speed are emphasized.

It is relevant at this point to call attention to the tremendous

amount of practice which is necessary to attain proficiency in a highly complicated skill. Just any kind of practice, even in large amounts, of course, is not productive. In fact, under some conditions, practice may be actually detrimental. But there are principles of effective effort in acquiring skills, and it is the purpose of this chapter and the next to outline these characteristics of economical learning. When practice is conducted under favorable and productive conditions, it still takes a great deal of it to develop the skills involved in playing basketball, or playing the piano, or singing. We would be very much surprised, probably, if we really determined how much practice a boy puts into basketball when he likes the game and wants to become proficient in it. (We would also be encouraged by the enthusiasm with which he practices when the end is really important to him.) The amount of practice which boys put into games is probably also much greater than that which they devote to skills that are a part of the school curriculum. Certainly it is much greater than that which is demanded by most learning experiments.

The revolt against formal drill, or sheer repetition, which has gained ground recently should not lead us to think that practice is unnecessary in learning. What it should influence us to do is to discover what forms of practice are fruitful and to guide the learner to make his successive efforts as efficient as possible.

THE VALUE OF VERBAL METHODS OF TUITION

Experimenters have studied the value of several types of verbal guidance in the acquisition of skill, including instruction on methods of work, calling attention to the significant aspects of the problem, stating the principle involved, and pointing out errors. Most of these investigations have shown that verbal guidance under certain conditions is beneficial. Some of the most important findings are as follows:

1. The value of guidance increases for a relatively short time with amount, and then decreases. The optimal amount is usually

reached early in the learning process, after which additional guidance is detrimental both for learning and retention. Although these are experimental findings, they should be interpreted rather cautiously. Many investigations of the acquisition of skill have been made with relatively simple tasks, and the role of tuition might differ somewhat in more complex abilities. Most of the experiments have not lasted until the subjects became very proficient, so that we lack evidence of the value of verbal tuition in what are really the later stages in learning. Had we made studies of complicated skills and carried the subjects to a high degree of efficiency, we might have discovered that we could help the performer by giving constructive guidance — suggesting a different method, pointing out a significant cue, or demonstrating a superior performance. Apparently, tuition after considerable practice works in some instances, at least, for baseball players often learn a great deal from coaching when they enter the “big leagues” from the “bush teams.”

2. Initial guidance is clearly superior in most of the experiments, with early interpolation the second most valuable position. Preventing errors before they have a chance to occur seems better than trying to eliminate them once they have been made.

3. Giving positive instruction is superior to calling attention to errors.

4. Too much guidance is probably detrimental if it reduces the learner's initiative and decreases his sense of personal responsibility for the performance.

Verbal guidance appears to be beneficial in motor learning where it enables the individual to attain insight into the nature of the task as a whole. It is often difficult, however, to express verbally the scheme or organization of an act of skill, and equally difficult to utilize a verbal exposition. The reasons are that those who wish to give guidance frequently have not verbalized their own motor performance as it was acquired, and that the learner also has little previous verbalized motor activity with which to assimilate instructions. We tend characteristically to depend upon the “feel” of an act experienced as an organic whole. It is usually difficult and perhaps unnecessary to describe complex motor performances in words.

THE LEARNING CURVE

We have already emphasized the fact that final proficiency is different from the performance at the beginning merely done more rapidly. Important qualitative changes occur

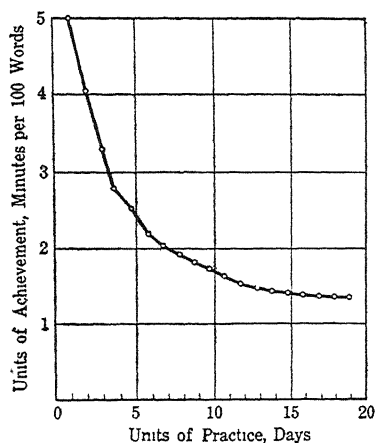


FIG. 12 PRACTICE CURVE OF TYPING

Reduction in time of performance with practice. (From Bills, *General Experimental Psychology*, Longmans Green, 1934)

performance. (See Fig. 12.) The curve will rise, on the other hand, if improvement is expressed as the amount accomplished per trial or in a given unit of time. (See Fig. 13.)

The Form of Learning Curves. The actual curves of learning, which are available in large numbers, are of various shapes. The forms are determined in part by the nature of the function itself and in part by the ability, methods of work, and previous training of the individual learner and the circumstances under which he works. Furthermore, different methods of plotting the same results will affect the shape of the curve. There is thus no single or typical curve of improvement, but many different varieties of which a few representative samples are given in Figs 12 to 14 inclusive.

during practice. The quantitative changes which also take place can be observed from curves of learning, which give graphic representations of the amount, rate, and limit of improvement brought about by practice. The measure of success is plotted on the vertical line of the graph, and the amount of practice, such as number of trials or amount of time spent, is indicated on the horizontal axis. The curve of learning will fall if success is expressed in the number of errors per trial or amount of time necessary for each performance.

Studies of learning curves will show that a rapid initial rise is a frequent but by no means universal characteristic. The actual increase in the output often rises rapidly in the earlier stages and usually more slowly at the final stages of an extended experiment on the acquisition of skill. This does not necessarily mean that one is learning better in the early stages. The rapid initial rise may be due to such factors as these: (1) The utilization of previously acquired reactions which can be integrated fairly easily in service of the new goal; (2) the acquisition of the broad pattern of the new performance, the details of which are to be mastered later; (3) the organization of the task so that the easier phases of it are learned first; (4) the mastery of phases of the activity which make a great contribution to output as it is being measured; and (5) initial enthusiasm for the task. At later stages of practice, improvement becomes more difficult to attain; it develops through the refinement of smaller details of the act leading to greater precision, which, though important, usually does not cause a very great increase in measured output.

Curves characterized by a rapid initial improvement are negatively accelerated and convex in form. Positively accelerated, or concave, curves are also fairly common. They sometimes occur in acquisition of skill, as shown in the curve for ball tossing in Fig. 14. Slow initial improvement may be due to the early position of difficult phases of the task, to

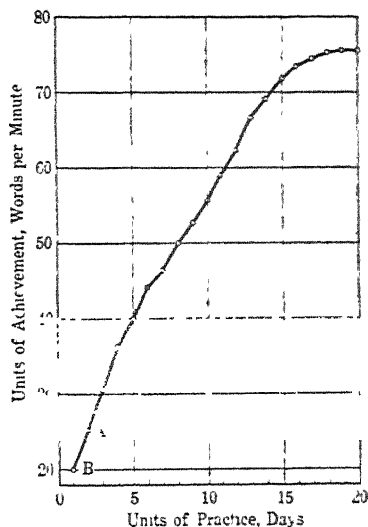


FIG 13. PRACTICE CURVE OF TYPING

Increases in amount accomplished with practice (From Bills, *op. cit.*)

difficulty in constructing a general pattern of the performance, to the acquisition of responses which in themselves do not represent output as measured but which are the means of later more rapid improvement. Curves of learning informational or logical material such as content in history, psychology, or mathematics are often positively accelerated, the more

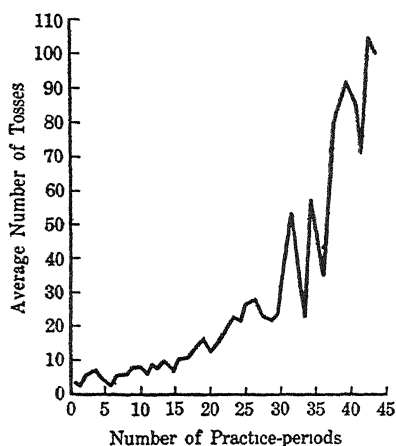


FIG. 14 IMPROVEMENT IN TOSSING AND CATCHING BALLS

The improvement is slow at the start but becomes more rapid as the subject becomes more proficient. Compare with Figs 13, 14, and 16. (Thorndike, *Educational Psychology*, Vol. II, after Swift.)

The task was to trace a six-pointed star with the hand covered but reflected in a mirror. If "series practice," or practice without rest intervals, was used in the beginning, improvement was slight, but when "recess practice" was employed the curve showed a rapid initial rise. At later points, where the development of speed and precision were the principal phases of improvement, series practice was effective.⁹

Most learning curves are abbreviated at both ends, as far as the entire course of actual improvement is concerned. The

one learns, the more easily he can learn the new material. Learning the basic vocabulary in the vernacular or in a foreign language makes progressive improvement in reading possible.

Positively accelerated curves are sometimes found with young children, or with subjects of inferior intelligence, when the improvement of older or more intelligent persons might take a different course.

The fact that the distribution of practice may influence the form of learning curves has been shown in studies of mirror drawing.

curve is probably never plotted from the absolute zero of performance, and the subjects in the experiments have not continued to practice until their limits of improvement were reached. If the entire curve in certain instances were determined, it might conceivably look like those in Fig. 15.

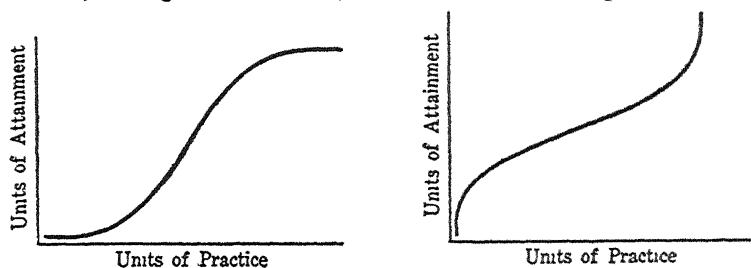


FIG. 15. POSSIBLE TYPES OF LEARNING CURVES WHICH MIGHT RESULT IF BOTH EARLY AND LATE STAGES IN LEARNING WERE STUDIED

The Physiological Limit. In the case of such skills as typing and writing, an absolute limit of improvement is theoretically possible but practically almost never achieved. The physiological limit is that degree of ability which a particular person cannot surpass because of absolute inherited limits in the speed or complexity of motor or mental response. In running 100 yards, jumping, tapping with a pencil, or other functions which depend upon sheer speed and force of muscular contraction with relatively little opportunity for developing new technique, the limit may be reached. But in complex performances such as typing, drawing, playing the piano, carpentry, or surgery, it is very seldom reached. In acquiring information in any field — law, medicine, history — there is no physiological limit; there is always a possibility of learning more, although there is a limit to the speed with which the items may be acquired. The limits which most persons actually reach are more likely to be “good enough” levels than real physiological limits. In most functions which have been steadily practiced for years, such as writing, reading, shaving, opening envelopes, tying neckties, sorting cards, memorizing, or studying, we are performing

with a speed and efficiency far below our maximum possibilities. Under special incentives such as keen competition or bonuses in pay, typesetters, telegraph operators, and typists in industry, as well as readers, writers, or spellers in school, frequently rise abruptly from a dead level which has held them for years.

The prime condition of improvement is that the performance be reorganized in better form, that is, on a higher level. Most of us eased off in our learning of reading, writing, and many other school functions as soon as we safely could — perhaps in the fifth or sixth grade — and entrenched ourselves in a low-level performance from which we have never emerged. Few people know how rapidly they read or write, how efficiently they memorize or solve arithmetic problems; few know when their improvement came to an end, or whether they have made any improvement in the last year or ten years. If you should now suddenly undertake to increase your speed of reading it would be found disturbing and perhaps unpleasant for a time, the inevitable result of breaking up an old organization of responses to supplant them by new. But this is the only way in which more effective performance — perfectly acceptable once well developed — can be attained.

Even in learning under experimental conditions, in which the incentives to improve are great, especially when each day's work is recorded, the progress measured, rewards offered, and competition provided as incentives, the tendency to ease up is quite usual. Sometimes this shows itself in a level or "plateau" in the curve, although some levels, even declines, are otherwise occasioned. Figure 16 illustrates a plateau out of which the curve of learning emerges to reach higher levels. Often under ordinary conditions of life, where actual improvement is not insisted upon, cherished, and rewarded, the plateau becomes a permanent level.

Plateaus in the Learning Curve. Plateaus, although not inevitable, may occur despite an interest in improvement and an effort to secure it. Sometimes they are due, unintentionally

but unhappily, to hitting upon a bad habit or method which interferes with further progress until it is eliminated. In writing, a pupil may develop an unfavorable sitting position or too firm a grip of the pencil; in reading, a habit of pausing too frequently in a line, or of giving too much attention to the minute details of words; habits which may inhibit progress until they are corrected either accidentally or after diagnosis

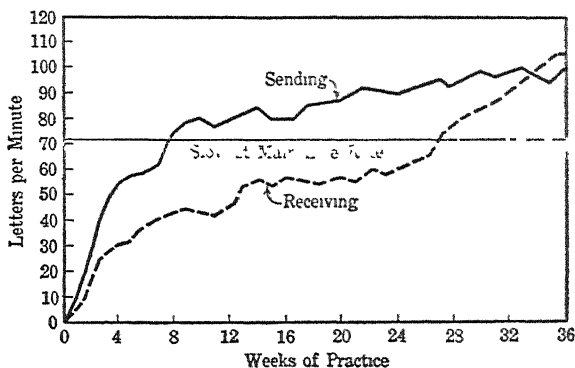


FIG. 16 IMPROVEMENT IN TELEGRAPHY

The upper curve shows the results for transmitting messages, the lower the rate of receiving. Note, just above the word "receiving," the plateau which extends over a period of nearly ten weeks, followed by a rapid rise. The line marked "slowest main line rate" indicates the slowest rate at which commercial messages are sent. (From Starch, *Educational Psychology*, after Bryan and Harter.)

and positive treatment. Plateaus may be caused occasionally by eye trouble, fatigue, and other physiological conditions, despite intentions to improve.

There are a great many other possible causes of plateaus, among which are the following: (1) undue attention to one part of the task, which disturbs coordination of responses; (2) shifting attention from one phase of performance to another — an emphasis on speed may affect improvement in accuracy adversely, and vice versa; (3) transfer of errors from one part of the activity to another; (4) lack of balance among different phases of a complex skill; (5) the persistence of ineffective methods of work; (6) failure to adopt a consistent method of practice; or (7) a change in method for the worse.¹⁰

Several factors as yet insufficiently investigated are probably related to temporary or even extended cessation of improvement. One of these is inadequate "pacing," that is, too great gaps in the difficulty of a series of related activities. The learner finds the next steps beyond his level of insight, which forces him back on less intelligent and less well-directed methods, and may also seriously affect his attitude toward the task. More careful gradation of the work, so that all the essential steps in progressive mastery are laid out, would make continuous improvement more likely. This problem of "pacing" is closely related to the matter of readiness to learn, which was discussed in Chapter IX.

At times an apparent plateau actually masks an underlying process of development essential to further improvement. This is the case when lower order responses are fused or integrated into a new and more complex pattern. In an early study on learning in telegraphy, it was found that after several weeks of practice, the curve for receiving connected discourse showed a plateau which lasted for a considerable time in spite of conscientious efforts to improve. Measurement of progress in receiving disconnected letters and words during the plateau for connected discourse revealed, however, that gain in these "lower order skills" was being made. When these elementary responses became sufficiently automatic to permit the development of the more complex integration, the curve for receiving connected discourse began to rise again.

Could plateaus caused by an underlying organization of simpler skills into more complex response patterns be avoided by practicing the larger unit from the beginning? In some performances, at least, this has proved possible. Having subjects practice on word units from the beginning, rather than upon isolated letters, tends to circumvent plateaus in typewriting which are due to the coordination of part responses into a new whole ¹¹

In an experiment involving the estimation of time, direction, and force of a swinging pendulum, the task was arranged

so that it could be presented and learned as a complex whole, or broken into elements each of which was learned separately. The learning curves of subjects who attended to the whole complex throughout the course of learning showed no plateaus.¹²

Short-Time Fluctuations in the Curve of Learning. The plateau, an extended level or depression in the curve of learning which may last for weeks or months, is not a universal characteristic of any function or any person, but short-time, day-to-day ups and downs are practically universal (See Fig. 14.) These fluctuations are due to temporary habits, good or bad, differing bodily conditions, interests, desires, incentives, varied states of readiness, or other temporary influences. Individuals will have not only good and bad days, but good and bad hours or minutes during the same day, often for reasons that are difficult to discover.

Educational Implications of Learning Curve Data. Do these facts concerning curves of improvement have any significance for the guidance of learning? They certainly suggest that the teacher should make continuous inventories — not merely periodic examinations — of pupils' progress. As a means of forestalling plateaus due to inefficient practice procedures, these appraisals should not only measure output, but should also reveal the learners' methods of study and of attack on their tasks. It is particularly important in the early stages of learning to detect errors which, if allowed to persist, may become difficult to break and may impede progress or make it impossible. By controlling motivation, the organization of units of instruction, and learning procedures, teachers and pupils together may prevent many plateaus. But when they do occur, they should be detected in their early stages, before undesirable causes are habituated and continued failure to improve destroys interest and confidence. This calls for a careful diagnosis of underlying factors and for constructive treatment — a better gradation of learning outcomes, more meaningful treatment of material, an adjustment

of the length and distribution of practice periods, or a fresh approach to revive interest. One of the most productive means of maintaining interest is to make the pupil aware of the improvement he is making. All these considerations emphasize the fact that examinations should be given less frequently for ranking and marking students and more commonly to appraise growth and to diagnose difficulties. Tests should be used principally as learning instruments — as means of teacher guidance and of pupil self-guidance and adjustment. To assign marks for these examinations is likely to reduce their usefulness as means for the effective control of learning.

SUMMARY

The positive suggestions for economy in motor learning are the following

1. Make a real study of the character of the function to be learned. Pay particular attention to the organization of the performance as a whole. For this purpose utilize such aids as:
 - a.* Verbal descriptions and expositions.
 - b.* Direct observation of performances or models, supplemented, perhaps, by slow-motion pictures, graphs, or other devices which serve to give a clear picture of the structure of the performance.
 - c.* Practice at first with manual guidance only if it helps to get the "feel" of the act as it should actually be performed.
2. Attend to the appropriateness of your own reactions as you learn. Develop the ability to select and utilize fruitful responses by discerning their relevance to the goal, and to detect and eliminate errors.
3. Learn as nearly as possible in the setting in which the act of skill must be really executed. Do not depend upon formal exercise of the parts of a function except where the part offers unusual difficulty, but practice the act as a whole.

- 4 When integrating previously learned movements into a new performance, pay especial attention to the organization of these responses into a smooth-working pattern.
- 5 Avoid overemphasis on any one phase of a total act, for this may destroy the balance and effectiveness of the performance. Strive to fit details together into the proper timing and rhythm, or scheme of the entire activity.
6. Avoid stereotyping of activity; skill demands flexibility in attaining the necessary goal.
7. Form and accuracy, rather than speed, should usually be stressed in the beginning. One should strive for refinement and precision more and more as learning proceeds into its later stages.

It is apparent that there is no one curve of learning. The particular form of the curve depends on many factors such as the nature of the skill, the maturity of the learner, the distribution of his practice, and the extent of his practice in related activities. Learning a motor skill is not just learning to do a given act faster. It involves periodic organization of responses into more integrated patterns. Plateaus in learning curves are sometimes periods of preparation for a higher integration, sometimes delays due to inappropriate habits, fatigue, and the like. Throughout all learning, short-time fluctuations in efficiency are the rule. From a study of the characteristics of learning curves the alert teacher may obtain suggestions for the appropriate guidance of learning.

QUESTIONS AND EXERCISES

- 1 Does insight into methods of learning and the detailed operations during performance necessarily result from the possession of great skill in a function? Can you recall instances of great athletes, musicians, or artists who were poor teachers? Are fine scholars necessarily good teachers? Are they more or less likely than poor scholars to be good teachers?
- 2 Explain just what you do when you whistle. Study your vocal organs while whistling to see if you can learn facts about the activities involved that were not known by you before.

3. Apply the facts given in the text to the teaching of some athletic or recreational skill. Compare with methods you have observed in use.
4. Which is better practice for the varsity crew, rowing in indoor machines or rowing on the water? Explain. Which is better practice for the baseball team, practicing catch, grounders, batting, etc., separately or when playing actual games? Explain. Aside from playing actual games, what supplementary work is desirable? To what extent will throwing baskets in basketball from a stationary position increase ability to toss baskets during active competition?
5. Should the writer attend to the feelings in the fingers or the written product? The singer to the "feel" in the throat or to the vocal product?
6. Can you illustrate from your experiences the seriousness of accidental errors and the difficulty of getting rid of them?
7. Give three examples of skills commonly learned in segments that might be learned more effectively in the forms in which they will eventually be used.
8. Just what is meant by the physiological limit? In what functions have you reached your physiological limit? See if you can increase your speed of tapping or of saying the alphabet.
9. Name functions in which a slight improvement can be attained only at a great cost of time and effort. Name some where the experiment is worth the cost, some in which it is not.
10. How may we determine the optimum development of school functions — reading, spelling, writing, typewriting, speed and accuracy of multiplication? Cite opinions or experimental evidence concerning the degree of efficiency demanded by various vocations.
11. Can you give any illustrations from your own experience in which improvement has been blocked by the formation of inappropriate habits, loss of interest, staleness, or fatigue?
12. What does a pupil in school know about his curve of learning in various functions? What should he know? How might such curves be secured?
13. Criticize this statement: "We learn to swim in winter, and learn to skate in summer." Account for any appearance of improvement as a result of a period of no exercise.
14. If one plays tennis only two months per year, but plays baseball three months and handball seven months, would you expect the skill in tennis to deteriorate during the ten months as much

15. In the light of the discussion in this chapter on the value of verbal methods of tuition explain how you would guide a child who was (a) learning to play tennis, (b) learning to build a bird house, (c) learning to knit, (d) learning to do finger painting.
16. Do you agree with the aphorism. "Practice makes perfect"? Defend your position
17. Although a swimming coach at a large eastern university has trained a phenomenal series of championship teams, he is reputed to be almost unable to swim himself. Do you think this could be true? In training a team what advantages might a nonswimming coach have that a champion swimmer as coach might lack?
18. At what point in the course of learning is an emphasis on speed desirable? Cite several examples of types of learning and point out the effects of speed-pressure at each stage of learning
19. Suggest a type of learning which might, if completely plotted, conform to the first curve of Fig. 15. What types might conform more nearly to the second curve of Fig. 15?

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CHAPTER XII

Principles of Guidance in Learning — II

PRINCIPLES OF GUIDANCE IN THE ACQUISITION OF VERBAL ABILITIES

The Value of Form in Learning. It is much more difficult to learn a series of items in which there is no organization than one in which a form or plan can be discerned. This principle can be demonstrated experimentally rather easily. Guilford¹ had college students memorize three types of number series. Two of the series were presented first, a *Y* series in which the numbers were arranged according to a definite scheme and an *X* series in which there was no plan. The *X* and *Y* series were presented alternately, and exposure for a period of two seconds. After each exposure the subject attempted to repeat the items. The students were instructed to memorize the series, but were not given the plan of the *Y* lists.

The subjects required an average of 3.2 repetitions to learn the *X*, or unformed, series. For some of the subjects, no form emerged from the *Y* series, and in these cases the average number of repetitions for memorization was 4.6. Those who perceived the plan, however, learned with an average of 1.4 repetitions. Next a third, or *Z*, series was presented, and the subjects were informed that each list was constructed according to certain principles which they were to watch for while trying to memorize the items. When the form failed to emerge in this series, the average number of repetitions necessary was 4.25, while an average of 1.2 was sufficient when the scheme was discerned. Looking for form and failing to

find it seemed to retard learning, since in the *X* series an average of 3.2 repetitions was sufficient for memorization

Guilford found from his subjects' introspective reports that the form did not emerge all at once, but appeared in steps. First, there was a feeling that there was order or regularity in a series, but the subjects could not describe it. The second stage was a recognition of the direction of the organization, for example, an awareness that the numbers were arranged in ascending order. Third, this awareness became more explicit, and finally the specific relationships of the numbers emerged, and could be stated in definite form. These results were interpreted as follows.

... a highly unitary form in a series of numbers, even though unfamiliar, greatly facilitates learning, and the failure of form to emerge, when one of a certain kind is expected, interferes with memorizing. Form takes precedence over the members of the series and their interrelations, and once experienced it emerges more readily in a series possessing new members. Under the conditions of our experiment, the forms in series of numbers emerged step by step, and in direction from a general, outlined form to a more particular, structured form.

TABLE XIII

ILLUSTRATIONS OF STRUCTURED
AND UNSTRUCTURED NUMBER SERIES

| <i>X</i> | <i>Y</i> | <i>Z</i> |
|----------|----------|----------|
| 2 | 5 | 8 |
| 3 | 6 | 9 |
| 7 | 8 | 11 |
| 10 | 11 | 14 |
| 19 | 15 | 18 |
| 24 | 20 | 23 |
| 29 | 26 | 29 |
| 32 | 33 | 36 |
| 48 | 41 | 44 |
| 58 | 50 | 53 |
| 65 | 60 | 63 |
| 72 | 71 | 74 |
| 88 | 83 | 86 |
| 91 | 96 | 99 |

* From J. P. Guilford, "The Role of Form in Learning" 2

Recently reported studies have indicated that some kinds of grouping, or organization, are more effective than others in learning. In one of the experiments, the subjects were asked to learn a series of numbers in different ways. The numbers were:

2 9 3 3 3 6 4 0 4 3 4 7
5 8 1 2 1 5 1 9 2 2 2 6

Four different but comparable classes of subjects learned or dealt with the numbers in different ways. Class I was told that the numbers (placed on the blackboard in the form above) were arranged according to a principle, and that both rows were built according to the same rule. They were given three minutes to study the series. For Class II the numbers were written in the following way 293 336 404 347 These subjects were advised to read the numbers aloud rhythmically five times, as two-nine-three Class III was given the figures on the blackboard as amounts of government $\times 10^6$ and told to repeat the numbers aloud five times:

\$2,933, 364,043 47 in 1929
\$5,812, 151,922.26 in 1936

Class IV was given a lecture on government expenditures in which the following numbers were written on the blackboard and referred to several times:

| | |
|-----------------|------------------|
| \$2,933 million | \$15,192,226,000 |
| \$5,812 million | \$36,404,347,000 |

In tests one-half hour and also three weeks later, the subjects were asked to write down as exactly as possible all figures which had been placed on the blackboard in the learning or instructional period. The results are given in Table XIV.

As a result of such experiments as this one, the investigator concluded that various types of grouping may aid learning, but that some are more "adequate" than others. The most adequate are those which are based upon intrinsic relations. The organization of a series of numbers according to a principle is an example of the kind of grouping which seems most

effective in learning and in delayed recall. The same author has offered four rules of grouping, which may be interpreted as tentative hypotheses

- Rule 1 Between members of the same group there is a stronger association than between members of different groups
- Rule 2 Part of a group has the tendency to reproduce the entire group
- Rule 3. Groups have their own associations, which may be different from the associations of their members.
- Rule 4. Grouping facilitates learning ⁴

TABLE XIV

REPRODUCTION TESTS WITH NUMBER SERIES *

| | <i>Number of Subjects</i> | <i>Percentage of Subjects Making Correct Reproduction</i> |
|-----------|---------------------------|---|
| Class I | | |
| Test | 29 | 38 |
| Retest | 26 | 23 |
| Class II | | |
| Test | 30 | 33 |
| Retest | 23 | 0 |
| Class III | | |
| Test | 30 | 20 |
| Retest | 21 | 0 |
| Class IV | | |
| Test | 23 | 0 |
| Retest | 17 | 0 |

Learning by Whole and by Part Methods. The role of form in learning is closely associated with the problem of the relative superiority of whole and part methods of studying and memorizing. In learning a poem, for example, one might either practice it as a whole, or memorize it verse by verse, or even a few lines at a time. If a person were given an assignment of substantial length, he might study it in its entirety or work at it piecemeal. If the situation as a whole is too long or complicated to deal with as a unit, is it possible to break it into more manageable segments and yet retain the organizing and directing effect of meaningful relationships?

* From G. Katona, *Organizing and Memorizing*.³

Experimental results on the whole-part problem do not permit a simple and generalized statement of the comparative efficiency of the two methods. A critical analysis of the earlier investigations revealed that the results were statistically valid in only six out of thirty experiments, and that they did not justify any generalization concerning the conditions of economy involved.⁵ Since that time, although the whole method has proved superior to part methods in the majority of experiments, conflicting results have still been secured. For example, one investigator reported ten experiments on the relative efficiency of whole and part methods in learning poetry, statements in chemistry, and simple directions relating to typewriting. Although the whole method was superior in obtained results in six poetry experiments, the differences could have been due to chance in all but two cases. From the entire group of investigations, the author concluded that there was no general trend of greater economy for one or the other method.⁶

Structure and organization of the material to be learned. Much of the conflict in experimental results and the confusion in interpretation are due to the fact that the word "whole" cannot be used in any absolute sense. A collection of items without systematic order or relation, either spatial, temporal, or ideational, even though repeated as a unit in memorizing, scarcely can be called a functional whole. A list of nonsense-syllables, for example, has little internal organization, and one might expect part methods of learning such material to be equally effective, or even more so, than the whole method. Pechstein actually discovered that the progressive part method was superior to repetition of lists of thirty-two nonsense-syllables as a whole.⁷ After examining the results of several investigations, Woodworth came to the conclusion that "where the opportunity for systematic wholeness of response was small, the advantage of the whole method was also small."⁸ In other words, the superiority of the whole method depends upon a high degree of integration in the material or the activities to be learned. This is to say that

wholes should be defined in a qualitative, rather than a quantitative, sense.

This hypothesis has been subjected to experimental verification, with results that are more suggestive than definite at the present time. The design of the experiments was based on the principle that a whole was not a mere aggregate, but "a definitely segregated, independent pattern which possesses unity, coherence, and meaning in itself above that implied by its parts. Conversely, a part is an element in a total situation which is essential to the meaning as a whole, but which loses its peculiar meaning when isolated from the whole." The material in one of the experiments consisted of geometric designs graded from loosely integrated figures to closely integrated ones. The designs, which are reproduced in Fig. 17, were drawn on cardboard and glued to plywood, which was then cut into sixteen pieces. Groups of students assembled the puzzles, either part by part or by dealing with the entire design. The author concluded that the results, though not entirely unequivocal, tended to support the hypothesis that the superiority of the whole method varies roughly with the degree of unity or meaning in the material.⁹

The same person conducted further experiments in an attempt to substantiate this conclusion, using problems in mirror drawing, number codes, chess patterns, and a repetition of the block design. He decided from the results that although the part method resulted in a saving in time and errors in the original presentation, the whole method was most economical in terms of mastery and retention. He concluded that when a whole consists of a unit which is based upon intrinsic relationships and which contains a large ideational factor, the material is more economically learned as a unit rather than piecemeal. He also emphasized the fact that learning the parts is not equivalent to learning the whole.¹¹

The approach and comprehension of the learner. The advantage of the whole method ~~not only~~ depends upon material which has a coherent structure and meaning, but upon the learner's

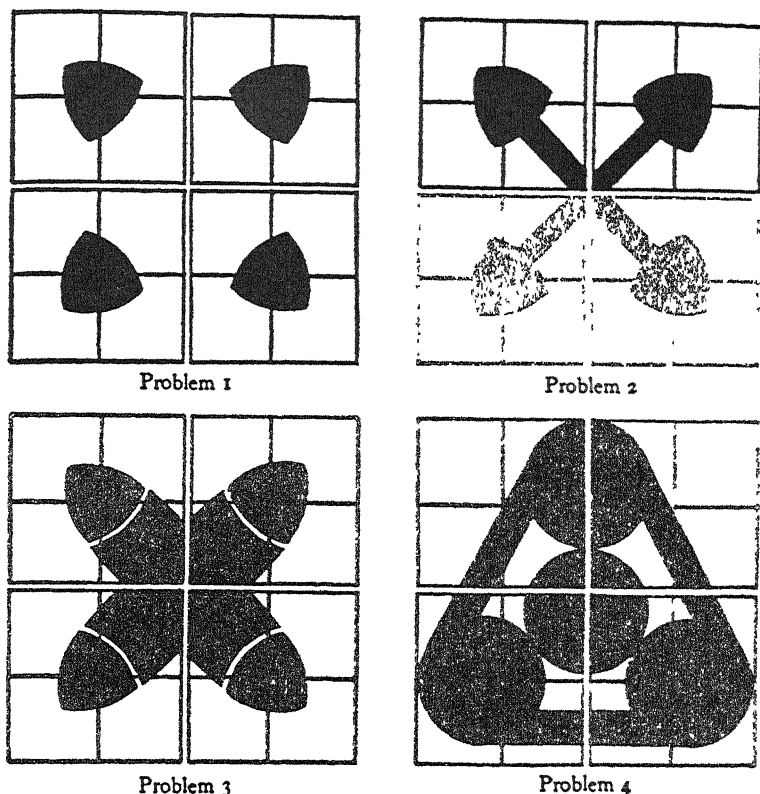


FIG 17. BLOCK DESIGNS FROM THE SEAGOE EXPERIMENT ON WHOLE-PART LEARNING

Each of these figures, representing various degrees of design integration, was cut into sixteen parts for reassembly by the subjects (From M. V. Seagoe, "Influence of the Degree of Wholeness on Whole-Part Learning," *J of Exp Psychol*, 1936, 19, p. 764.)

effective apprehension of this pattern. There is now a substantial body of data to support this inference. The following experimental results are in point:

1. Intellectually superior children can use the whole method more effectively than "normal children" ¹¹ This is probably due to the greater ability of gifted children to understand the meaning of the material as a whole and to identify the significant relations among ideas. Unless the learner can apprehend the design of an

integrated unit, the whole method is likely to be no better, or even less efficient, than some one of the part methods

2 The whole method tends to lose its superiority with long and difficult material. For example, with poems which are easy to understand, continuous in thought, and pronounced in rhythm and rhyme the advantage of the whole method is strong, particularly when retention is the criterion. On the other hand, if the material is disconnected or hard to understand, the advantage of the whole method is greatly lessened, and in certain situations may be surpassed by one of the better part methods.¹² The length and difficulty of the material to be learned are both related to the extent to which one can understand and hold in mind the meaning of the situation as a whole. Long and difficult tasks may have to be subdivided for economical mastery. "Pure" part methods in such instances usually prove relatively inefficient. The progressive part method, however, in which each section when mastered is connected with those previously learned, often works advantageously. Finally, a closely knit pattern of ideas, rather than a loosely organized series of segments, is conducive to the efficacy of the whole method.

3 There seems to be an optimum difficulty of material for pupils of different ages and levels of mental maturity, so far as methods of memorization are concerned. The superiority of the whole method tends to decrease if the material is too easy or too difficult for the learner.¹³

4 There is some evidence that a short period of learning time favors the part method in certain types of material, while a longer period may enable the whole method to demonstrate its superiority.

5. The whole method sometimes appears at a disadvantage partly because many, perhaps the majority, of the subjects in the experiments were accustomed to piecemeal procedures, and therefore managed the newer approach rather ineffectively. The strangeness of the method probably actually frightened them in some instances.

In summary, the most effective method of learning depends, first, on the degree of integration, difficulty, and length of the material, and, second, upon such factors as the individual's intelligence, age, meaningful background, and characteristic methods of study.¹⁴ If a task is too difficult or too long to learn expeditiously as a unit, it may be desirable to break it into

segments in order to manage it efficiently. This division should always be made with reference to meaningful units, rather than to arbitrarily separated parts, and with respect to the most comprehensive section that the individual can manage efficiently. Furthermore, even though it should be necessary to differentiate the task into intermediate goals, it is important to try to get a general idea of the whole situation, so that as one works at each part he is aware of its relation to the whole and to the other sections. Thus Woodworth points out that, whatever the size of the optimal learning unit for a given person, there are certain important "guiding facts" that can be learned only by dealing with the problem as a whole, whether it be a poem, a prose passage, a visual form, or an assignment. These guides, he explains, are the general direction of the goal and the general course of the correct responses. This general orientation, he points out, should be attained as early as possible and used as a frame for organizing the parts.¹⁴

In connection with the acquisition of motor skills, we expressed the judgment that the elements of a performance are usually most economically perfected in practicing the whole, but pointed out that specific practice on the parts should be utilized in case of troublesome phases or particular difficulties. We also stressed the principle that, in such instances, the learner should hold the part-whole relation constantly in mind, and make the segment an integral part of the total performance as rapidly as possible. This might be called a "whole-part-whole" learning sequence. The same general form of organization seems to hold for ideational learning.

Emphasis in learning on actual performance. By referring to one more experiment, we may emphasize the peculiar advantage of the whole method. Students in elementary shorthand classes in eleven schools participated in an investigation to determine whether it was better to learn by beginning with isolated words and going gradually to phrases and finally to sentences, or by the more comprehensive method of writing

sentences from the start. Six schools used the sentence unit, and five, the word unit plan. In every comparison made, the sentence unit method proved definitely superior, in spite of the fact that four of the six teachers who used it were trained and accustomed to the word method. The authors concluded — and this is the point generally relevant to learning by “wholes” — that the sentence method illustrates the principle that one should learn a thing in a realistic setting and in terms of an actual performance.¹⁵

Organization and the Curriculum. Implicit in the data on the influence of form and of whole methods in learning is the generally accepted principle that meaningful material is more easily learned and longer remembered than relatively meaningless content. Meaning involves structure; it inheres in relationships. Dewey has pointed out that “to grasp the meaning of a thing, an event, or a situation, is to see it in its relations to other things: to note how it operates or functions, what consequences follow upon it, what causes it, what uses it can be put to.”¹⁶

One of the most important developments in modern education is the substitution of organized learning for the mere acquisition of highly specific and discrete items of information. Sound educational procedures do not disregard information; rather, they emphasize the learning of facts for definite purposes and in meaningful relations. We have already pointed out that the most important of these relations is that between means and end. The fundamental basis for the organization of experience, therefore, is activity or study directed toward worth-while goals, preferably those constructed cooperatively by the pupil and the teacher. There has also been a reaction against the traditional daily lesson recitation. These small blocks of subject matter were not only remote from pupils' needs and experience in many instances, but frequently constituted relatively independent units. As the pupils studied a lesson (often based upon no more coherent plan of organization than a textbook chapter or

a uniform number of pages) he usually did so without relating it to a more comprehensive problem or movement or idea. Furthermore, there were all too few opportunities, under the lesson-learning regime, to organize the daily fragments at some later point into a coherent system of ideas. The writer recently visited a recitation in which the "lesson" encompassed the end of one large section of the history text and the beginning of the next one. The teacher asked fact questions over the assignment without stopping to summarize the broad topic which had been completed or giving any introduction or preview of the succeeding section, or in any other way taking advantage of the principle of meaningful organization. This is an extreme case, of course, but there are all too many instances which approach it in which teachers do not even utilize what little structure their textbooks may offer.

Organization in terms of the learner's experience. Fortunately, "lessons" are more and more giving way to units of learning in which the bases for the *selection* and *organization* of subject matter and learning activities are the learner's purposes, or, expressed from the observer's point of view, are the changes in behavior which constitute the individual's process of development. Many textbook writers and curriculum makers got out of this fundamental general idea of the unit only the notion of comprehensiveness. The effect of their efforts, therefore, was mainly to put up the conventional subject matter in larger parcels. Occasionally this was accompanied by more attention to internal organization, social usefulness, or relation to pupil interests and purposes. More often, however, it amounted to little more than a substitution of the word "unit" for the word "chapter" in the table of contents, or a collection of chapter titles under sectional headings, sometimes deceptively stated in problem form, without any attempt to provide a correspondingly inclusive framework of ideas.

Although there is unanimity on the importance of organization in *learning*, there is a sharp division of opinion on the

organization of the curriculum. Judd has insistently championed the importance of systematic thinking and severely attacked atomistic theories of learning and the "mere acquisition of detached and unorganized facts." He has criticized with almost equal severity the movement to disregard the school subjects, or the academic disciplines, and to organize the materials of instruction principally around activities, or projects, or problems. He has contended that the organized school subjects provide the best means of stimulating systematic and relational learning leading to understanding of general principles.¹⁷

On the other hand, there are those who contend that relationships which arise from using material and activities purposefully in facing and adjusting to an actual life situation — which may be no respecter of the outlines of highly differentiated and logical bodies of subject matter — are more functional and dynamic than longitudinal forms of organization.¹⁸

The subject curriculum. Actually, both forms of organization, the one based on the outlines of subjects or fields of knowledge, the other based upon life activities or experiences, are important in mental development. Horn, writing about the social studies, puts it in the following way: "One doubtless needs organizations that focus directly upon social conditions, problems, and processes of modern life. One also needs those that furnish the point of view for thought about these conditions, problems, and processes. The most important of these organized backgrounds appear to be history and geography, but others, such as political science, economics, and sociology, are also needed " ¹⁹

Arithmetic provides another example of the necessity of both types of organization. It is essential to appreciate the social significance of number processes and to use arithmetical abilities in purposeful social situations. But in order to perceive the quantitative aspects of a great *variety* of specific social situations, and to use arithmetical abilities correctly in dealing

with them, it is probably important to understand number processes *mathematically*, that is, to use them as means of precise thinking which derive their character from the nature of the number system. This makes the study of *arithmetic* essential.

Dewey has explained that, although the need for subject matter should grow out of the pupil's experience, "finding the material for learning within experience is only the first step. The next step is the progressive development of what is already experienced into a fuller and richer and also more organized form, a form that gradually approaches that in which subject matter is presented to the skilled, mature person."²⁰

The study of systematic subject matter fields probably should characterize secondary more than elementary education. Nevertheless, there seems no reason, psychologically, to believe that the curriculum at any stage should be exclusively either a subject curriculum or a unified experience curriculum. And it is important to remember again that integration properly refers, not to material or courses of study, but to behavior. Curriculum and method should be so organized as to stimulate and train the individual to systematize, to integrate, to unify the multitude of things which he learns, to relate them in a great variety of useful ways.

Reading and Recitation in Learning. Several years ago an experiment using squads of seven or eight children in grades three through⁷ eight, and individual adult subjects, demonstrated that a combination of reading and recitation was superior to reading and rereading in learning nonsense-syllables and meaningful material in the form of biographies. The "recitation" method consisted in a certain amount of initial reading followed by attempts to recall when not looking at the material — prompting oneself speedily by glancing at the paper when unable to proceed. Table XV summarizes the results.

A study of the table will disclose several facts: (1) The greater the amount of time devoted to recitation, the greater

the percentage of the lesson recalled. Of course, some time must be spent at the start in reading the material. (2) One does better, relatively, in learning sense material by reading and rereading than in learning nonsense-words which, to begin with, contain fewer meaningful associations which make recall during ordinary reading possible. (3) The recitation method results in the learning of a different group of reactions, the kind that make for more permanent retention, as indicated by the fact that the greatest superiority is shown in the columns of the table that give the percentages remembered after four hours.

TABLE XV
RECITATION VERSUS REREADING *

| <i>Material Studied</i> | <i>16 Nonsense-Syllables, Per Cent Remembered</i> | | <i>5 Biographies = Total of 170 Words, Per Cent Remembered</i> | |
|---|---|--------------------------|--|--------------------------|
| | <i>Immedi- ately</i> | <i>After 4 Hours</i> | <i>Immedi- ately</i> | <i>After 4 Hours</i> |
| All time devoted to reading | 35 | 15 | 35 | 16 |
| $\frac{1}{2}$ of time devoted to recitation | 50 | 26 | 37 | 19 |
| $\frac{2}{3}$ of time devoted to recitation | 54 | 28 | 41 | 25 |
| $\frac{3}{4}$ of time devoted to recitation | 57 | 37 | 42 | 26 |
| $\frac{4}{5}$ of time devoted to recitation | 74 | 48 | 42 | 26 |

More recently a different investigator studied the same problem with whole classes of fifth and sixth grade children under normal school conditions. They not only learned nonsense-syllables, but also spelling words, arithmetical facts, and English vocabulary. As in the study summarized above, the amount of time devoted to recitation varied in the several experiments from twenty to eighty per cent. In this investigation another variant of the recitation method was used. The children were advised to study the material until they felt sure they had learned it. Then they were to attempt a recall, looking at the answers when they were unable to remember

* From A. I. Gates, *Recitation as a Factor in Memorizing*.²¹

them. They continued to study in this way until the ten-minute period was finished. All children were required to use the recitation method after five minutes whether they felt ready for it or not. Immediate retention and delayed retention (after three or four hours) tests were given. The results for one of the experiments on spelling, with data for all classes combined, are given in Table XVI.

TABLE XVI

COMPARISON OF READING AND RECITATION METHODS ON IMMEDIATE AND DELAYED RETENTION TESTS (SPELLING)*

| <i>Method</i> | <i>Mean Scores</i> | <i>Mean Scores</i> |
|---|---------------------------------|-------------------------------|
| | <i>Immediate Retention Test</i> | <i>Delayed Retention Test</i> |
| 1 Reading | 7.17 | 7.20 |
| 2 $\frac{1}{3}$ of time devoted to recitation | 7.34 | 7.77 |
| 3 $\frac{2}{3}$ of time devoted to recitation | 7.20 | 7.73 |
| 4 $\frac{3}{4}$ of time devoted to recitation | 8.49 | 8.54 |
| 5 $\frac{4}{5}$ of time devoted to recitation | 8.53 | 9.02 |

The method which employed the largest amount of recitation gave the best results on both tests. The superiority of this procedure over the reading method was 19 per cent. Although devoting 60 per cent of the time to recitation was significantly better than spending it all in reading, there was little difference between the 60 per cent and 80 per cent methods. The data also indicated that the proportion of recitation had to reach a certain point before its superiority became conclusive. The differences between Methods 2 and 3, and Method 1, were not significant. The results of all six experiments in the investigation may be summarized as follows:

1. Recitation methods of learning under ordinary school conditions, no matter how small the proportion of time devoted to recitation, were superior to the reading method in every experiment, in terms both of immediate and delayed retention tests. The superiority of the best recitation method over the reading method ranged from seven to twenty-eight per cent

* From G. Forlano, *School Learning with Various Methods of Practice and Rewards* ²²

2. In general, recitation methods were equally efficient with sense and nonsense material

3. In general, the superiority of recitation methods was much greater for delayed than immediate recall

4. For given material and time available for learning, there is an optimum combination of reading and recitation.²³

What are the possible reasons for the superiority of recitation methods of learning? The following have been suggested. (1) it furnishes an immediate goal to work for; (2) it gives exact knowledge of results, leading to economical direction of effort; (3) it confirms correct responses, and induces confidence; (4) it favors an independent and aggressive attitude; (5) it favors the organization of the material into a coherent response pattern; and finally (6) it utilizes this guiding principle: *Consider the situation which life will present and so arrange the circumstances of learning that the individual will secure experiences in making those reactions which will be demanded.*

Reading the material to be learned seems to be particularly valuable in the early stages because it provides an opportunity to explore the situation as a whole, first in the form of a general survey and then in more detailed fashion. Furthermore, recitation, if conducted too early, may tend to establish errors.²⁴

Other experimental evidence than that on reading and recitation has demonstrated the meager results which passive rereading produces. It has been discovered in one study, for example, that a second reading added only from six to eight per cent in recall to the results of a single reading. On the other hand, making a summary under the guidance of directive questions proved superior to rereading. Reading guided by questions has also produced results superior to those obtained by careful reading and rereading.²⁵ Outlining has aided students significantly in studying history. These methods not only facilitate an active attack by the learner, but also provide means of organizing the material to be learned.

Massed versus Distributed Practice. If a learner has at his disposal seven hours a week for practice in typewriting, playing the piano, singing, etc., how may the time be most fruitfully distributed? Should he work continuously on one day for seven hours, or in half-hour periods with intervals of a half hour, an hour, six hours, or twenty-four? Experiments have not yielded entirely conclusive results, and but few functions have been tested at all. The optimum length and spacing of practice periods depends so greatly upon the nature of the task and upon individual differences in learners that it is impossible to give directions which are valid for all situations. For example, there is some evidence that massed practice is efficient for easy tasks, while spaced practice is essential in long and difficult learning situations. We have already pointed out, in the case of mirror drawing, that spaced practice was necessary for rapid improvement in early stages and that massed practice was effective in attaining speed and in mastering details in later stages of learning. The optimum length and distribution of practice periods is also a function of the age and the experience of the subject. Nevertheless, in spite of these inevitable variations, the evidence clearly shows that, in general, distributed learning is better than concentrated practice. In several studies, to give an example, it has been economical to break up the available time into periods of thirty minutes or less, separated by intervals of from thirty minutes to twenty-four hours. Thus it would probably be preferable to make use of the seven hours by practicing twice a day for thirty-minute periods, or, if but three and a half hours were available, half-hour daily periods would be advisable.

One should point out, however, that very little research on this problem has been done with verbal and logical material and with children as subjects. It is very likely that under school conditions, with rich and interesting material which can be approached from many points of view and learned through a variety of activities — reading, observing, constructing, speaking, and writing — much longer work periods may

be possible even for young children. In fact, there is a tendency in the modern elementary school to dispense with the conventional daily program divided into relatively short subject matter periods, and to substitute a series of activities built around one or more problems or centers of interest. These cores can give continuity and organization to a considerable variety of experiences.

The advantages of spaced learning in many tasks, particularly in the early stages, may be due to such factors as these: (1) distributed practice may favor a variety of responses at a time when the correct reactions must be discovered; (2) early massing of practice may tend to establish errors occurring during the exploratory period; (3) spacing makes it possible for one to capitalize a fruitful variation which can then be followed up by more concentrated effort; and (4) spacing may conserve interest and forestall fatigue. It is also possible that, during recess periods, errors may tend to fade out, and one may gain new insight into the task to take to the next trial ²⁶

THE INFLUENCE OF SUCCESS OR FAILURE

Thorndike reports that adult subjects showed little decrease in achievement in an experimental situation when failure or frustration far surpassed the number of successes. Although he found that these persons worked at nearly their maximum capacity when required to continue, he admitted that, under ordinary conditions, they would probably have abandoned the task. Repeated failure under normal circumstances, or even long-continued frustration in an experimental situation, would probably have influenced their accomplishment adversely. Certainly children need the stimulus of success. Success reinforces performance, releases further energy, and engenders favorable attitudes toward learning. Repeated failure, on the other hand, puts a drag on learning. Constant frustration discourages effort, gnaws viciously at interest, and begets indifference, resistance, or even severe inferiority.

The reactions of a group of kindergarten children learning to recognize words illustrate the facilitating influence of success and the inhibiting effects of failure. The learning activities were set up as a game. Some children who failed to recognize the words for several periods began to show severe distaste for the task. One ran behind the piano to hide when the teacher came into the room. One said, "I'm tired of it. It makes me mad. This old game is no good." But when these same children, through more careful individual teaching, began to succeed at the game, their attitude changed completely. They expressed enthusiasm for the game, and were eager to play.²⁷

Results of Failure in Basic Skills. Other studies confirm the finding above and emphasize the importance of correct learning in the early stages of the process. A child who fails to acquire certain basic skills in reading when it is first taught finds his problems progressively acute as he meets learning situations which make greater and greater demands on reading ability. Continued failure due to reading disabilities all too frequently engenders such emotional disturbances as the following: nervous tension and habits like stuttering, nail biting, restlessness, and insomnia, defense reactions such as noisiness, defiance, or sullenness; withdrawal from normal social contacts, counterattack, including destructiveness, cruelty, or bullying; daydreaming; extreme self-consciousness; and complete defeat.²⁸ Recent studies of reading disability have revealed that failure is more often the cause of personality problems than the result of emotional difficulties.

Experts in the psychology of reading have demonstrated that a carefully individualized and scientifically developed program of reading instruction can effect a striking improvement in reading ability, general achievement, and emotional adjustment. This was the result of a project at Speyer Experimental School in New York City involving six classes of children in grades two to five. Five of these classes were composed of "dull normals," that is, children with I.Q.'s

ranging from 75 to 90. The other group consisted of reading disability pupils. Those in charge of the experiment doubted the general assumption that their subjects, because of poor achievement and low intelligence, were unable to acquire linguistic abilities. They believed, rather, that these pupils' difficulties had been caused in large part by attempting to learn in schools where methods and materials had been unsuited to them.

Instruction consisted of an activity program built around such centers of interest as a comparison of country and city life. Pupils engaged in a great variety of experiences. Reading and other linguistic activities appeared only to the extent that they proved interesting and productive in connection with the major purposes of the program. However, the teachers attempted to arrange as many reading situations as possible which contributed to the central projects. They used very little isolated formal instruction in reading, and made every effort to adapt materials and methods to the needs of individual pupils. Definite instruction with proper equipment lasted only three months, and the amount of time given to reading was not very great. In spite of these conditions, the remedial reading class, composed of disability cases, made a gain of thirteen months in reading ability. The other classes gained from eight to thirteen months in comprehension. Although the average I Q. of the pupils was only 82, all of the classes but one attained at the end of the year a reading ability equal or nearly equal to that reached by normal pupils at the same point. The comments of those in charge of the experiment are worth quoting:

It is the consensus of all who visited the school during the first and last month that the most conspicuous changes wrought during the term were in the children's behavior and in their attitude toward the school and learning. When they entered they were mostly disappointed, if not disillusioned, pupils whose previous work in classes containing a large number of superior children and with assignments beyond their ability had produced almost con-

tinuous frustration. As the result of the persisting difficulty and failure, they revealed various forms of unfortunate adjustments — sullenness, inattentiveness, fearfulness, embarrassment, annoyance, mischievousness, discourtesy. Before the term was over most of these unfortunate attitudes had disappeared. Children came to school with interest and eagerness. They had learned how to cooperate with one another, to respect and work with the teacher, and to enjoy as well as profit by the various learning activities which comprise the school day. The most obvious outcomes of the year were, in many respects, amazing changes for the better in school interests and action. . .²⁹

Certain schools, concerned about the possible undesirable and emotional effects of failure, have adopted a plan of promotion by age rather than achievement, or “100 per cent” promotion. But merely to promote a child who has failed to master the work of one level may serve only to intensify his deficiencies in learning more difficult tasks. The ultimate result of this process is to complicate rather than solve the problem of pupil adjustment. Promotion by age is defensible only to the extent to which each succeeding teacher adjusts the individual’s tasks to his stage of growth so that he progressively improves in his abilities. Individualization is essential for efficient learning, both for prevention of disabilities and for remedial treatment. We would be astonished with the improvement of pupils’ achievement if we were adequately to adjust materials and methods of teaching and learning to individual differences in interests, previous experience, and levels of aptitude and maturity. Furthermore, we could do much to aid the learner if we would praise more often than reprove, give positive directions rather than make negative demands, and place emphasis upon successes rather than upon errors.

Level of Aspiration. Success is not a simple matter, psychologically. It is related to the *level of aspiration*. As this term has been employed in experiments in motivation, it means the level of future attainment which the individual sets for himself in some task. Success, then, is interpreted,

experimentally, as a performance that is better than the level to which the individual aspired. Similarly, failure is considered to be achievement that is under the level which the individual proposed to attain. The level of aspiration may serve several purposes. In some instances it may serve as an incentive, that is, it may represent a goal or the desire to improve performance. Sometimes the individual may set his goals much too high in terms of his real ability, but persist in keeping them there in spite of failure to attain them. One explanation of this persistence is that to aspire to outstanding achievement is socially praiseworthy, and the individual maintains his self-esteem by keeping his ambitions high. Other persons, however, may interpret failure to attain their goals as a threat to self-esteem. Then they may lower their level of aspiration to avoid failure and deflation of the sense of personal worth.

Success and failure, so far as the individual's subjective experience is concerned, are relative to the level of aspiration. If one's level of aspiration is much lower than his possibilities of attainment, he may interpret relatively meager achievement (meager in terms of some objective criterion) as success. On the other hand, a person whose level of aspiration is unduly high may have a sense of failure when, in relation to ability, he had actually done very well. Thus, psychologically, success is often more dependent on what the individual's goal or expectation is than upon actual performance. It is probably important for one to set standards of performance for himself which are attainable with reasonable effort, but which are not too easy or too hard. If the task set for the individual is obviously too difficult for him, he may sense no failure because he considers the work beyond his ability. If the task set is obviously too easy, he may gain no feeling of accomplishment because he considers it below his ability. It has been discovered also that, after success, the level of aspiration is likely to be raised and, after failure, lowered. The best situation is one in which a person keeps his expectation at a level con-

sistent with his powers of attainment. This means that achievement standards should be individual rather than general or absolute. It is possible for teachers and parents to permit able pupils to set goals far below their ability, and to drive those of modest aptitude toward unattainable levels with unfortunate consequences.³⁰

The level of aspiration is closely related to success and failure in college. Many potentially gifted students are making mediocre scholastic records or worse. Personnel workers frequently find it difficult to diagnose these "underachievers," or to stimulate them to better accomplishment. Sometimes these persons are unaware of their own level of aptitude. Often, their academic experiences fail to challenge their interest and effort. Too frequently, they go to and through college without clear-cut purposes, either educational or vocational, or are unable to see any relation between academic work and their occupational goals. Previous experiences, including emotional difficulties, may also have caused them to lower their levels of aspiration.

Many college students find it necessary to lower, rather than raise, their levels of aspiration. Study after study of the vocational intentions of high school seniors and college freshmen has revealed that a large number of students had chosen occupations for which their measured aptitudes and achievements were entirely inadequate. For this reason, educational and vocational guidance at the college level becomes one in part of "down-grading." This reduction in level of aspiration is often a difficult adjustment to make at the time. But if it is accompanied by constructive guidance toward occupational goals consistent with real interests and abilities, the student will have a much more successful and satisfying college life and vocational experience. The secondary school should improve its guidance activities as rapidly as possible, so that a wise foundation for an intelligent vocational choice can be laid before college entrance. Colleges, too, must develop personnel functions so that students may be distributed among

curricular offerings with respect to their actual interests, aptitudes, achievements, and needs.

Knowledge of Improvement. If our conclusions with respect to the importance of success in learning are sound, knowledge of improvement should act as a strong incentive. Experimentally, this problem is somewhat difficult, since changes in the subjects' scores from one learning period to another must represent an actual increment or decrement rather than fluctuations due to changes in the difficulty of the task. This factor was effectively controlled in the most decisive investigation of the problem conducted under normal school conditions. Two equivalent groups of 358 fourth grade pupils each were given identical arithmetic drill exercises fifteen minutes a week for twenty-one weeks. The only variable was specific knowledge of improvement. The members of the control group never received their weekly scores. Those in the experimental classes, however, kept individual progress charts, and pooled their losses or gains in a graphic representation of improvement for the class as a whole. The record of actual improvement was made possible by using drill units for which standards had been provided. This scoring device compensated for differences in difficulty of the tasks.

The group which had continuous information concerning improvement made significantly greater gains than the control group. The distributions of gains for the two groups as a whole were divided at the first and third quartile points to study the effect of the incentive at different ability levels. The pupils in the experimental group were superior in the highest quarter and middle fifty per cent of the distributions. However, there was little difference between experimental and control subjects in the lowest fourth of the groups. In fact, neither group made much gain at this level of ability. The incentive factor had little opportunity to operate.³¹

Reward and Punishment. The "law of effect" has given impetus to many experiments on the influence of reward and

punishment on learning Thorndike himself has conducted or directed a large number of these investigations. Using monetary rewards, or simply saying "right" to the subjects when they performed correctly, he has amply confirmed his generalization that satisfying consequences strengthen the responses which they directly follow. He has discovered other interesting and significant facts concerning the operation of rewards. The influence of a reward is greatest when it follows the response immediately, and its potency decreases as the interval between a reaction and its aftereffect increases. In Thorndike's experiments at least, contiguity seemed more important than relevance in determining the influence of rewards. Thus he reported that a satisfying aftereffect strengthens somewhat the connection to which it is attached, even though it is essentially unrelated to the purpose for which the response was made and incongruous with the wants and interests of the person at the time.

The irradiating effect of reward. The effect of reward may also spread from the reactions to which it is directly attached to others in close proximity. The spread is both backward and forward; connections in the neighborhood of the directly rewarded one are also strengthened, even if they are themselves punished. The spread may also take a sidewise direction, to strengthen responses which are being made at the same time, or which are accepted as belonging to the one to which the reward is attached. This phenomenon suggests that, in applying rewards and punishments as a means of controlling behavior, one should let the individual know exactly what responses are being rewarded or punished. Even then, the effects may spread. In daily life, it is probable that many incorrect or undesirable activities are established because of their accidental temporal proximity to responses which are directly satisfying or which have been deliberately rewarded by someone.³²

The effect of punishment on learning We have already noted the fact that Thorndike, contrary to his earlier expectations,

discovered that annoyers do not actually weaken connections. Some of his more recent experiments on punishment have produced even more striking results. He has found that punished connections may be more, rather than less, likely to recur! This happened in experiments of the following type. He gave the subjects a list of nonsense-words each of which was followed by four English words, one of which was supposedly related to the stimulus word. This choice had been arbitrarily made by the experimenter. The subjects were asked to guess the "correct" response. As soon as they made a choice, they were told "right" or "wrong," or perhaps rewarded by small amounts of money or punished by an electric shock or a money fine, and given the next stimulus word. In summarizing evidence from experiments comparable to this, Thorndike reached the following conclusion:

In multiple-choice learning by human subjects where the situation vanishes immediately after the choice, is replaced by another, and recurs only after intervals of fifty to 200 seconds filled by other . . . situations and responses, a connection "punished" by the announcement of "Wrong" or "Wrong" plus one or more electric shocks, or "Wrong" plus a money fine is (practically without exception) strengthened by the occurrence in spite of the annoying aftereffect.³³

The question which then arose was what would happen if the subjects kept guessing until they hit upon the correct response before going on to the next stimulus situation. They would thus be "punished" for incorrect responses, but would have the satisfying aftereffect of a reward for the right one before moving on. The next time through the list, would the punished responses still be more, rather than less, likely to recur? An experiment showed that in the retained, as in the vanishing situation, "the occurrence of the wrong response strengthens the connection more than the punishment offsets."³⁴

As a result of these and other experiments, Thorndike came to the following conclusion:

The attainment of active rather than passive learning at the cost of practice in error may often be a bad bargain. . . . The learner's self-punishment when he makes a mistake may sometimes be no better than the punishment in our experiments.

The almost universal tolerance of imperfect learning in the early treatment of a topic, leaving it to be improved by the gradual elimination of errors in later treatments, is doubtless unsound and certainly risky. What removes the errors (later) is the rewarding of right connections and such rewarding might better be put to work earlier.³⁵

Much more experimentation on the persistence of error needs to be conducted. In Thorndike's investigations the correct reactions were arbitrary and not meaningful, so that the subjects could get no insight into the material they were required to learn. It may be that experiments using meaningful tasks related to significant purposes will make a much more substantial case for pupil discovery than for passive acceptance.

Even though annoyers do not seem to act directly on connections to weaken them, they nevertheless probably serve a valuable purpose in learning activities where errors occur. Thorndike has concluded, as a matter of fact, that there is probably slightly more rapid learning with punishment than without it. He suggests several possible values of punishment. It may serve to counteract a satisfying aftereffect of undesirable behavior. It may cause the learner to shift to other responses — perhaps to do something desirable and satisfying. Punishment may give information, particularly concerning the consequences of responses which otherwise might go unnoticed. Finally, punishment may act as a motivator. Thus the learner may try to escape it, or to speed up his search for the correct response. Punishment may likewise cause the learner to make a discrimination between essential cues to the solution of a problem. The informative and motivating functions of punishment may account for the fact that certain experiments have shown punishment on the correct responses to facilitate learning.³⁶ Intense punishment, however, may have a disruptive effect. When the task is easy or moderately difficult,

an increase in intensity of punishment may speed up learning and reduce the number of errors. If the task is difficult for the learner, however, increasing the intensity of punishment may quickly cause disruption rather than facilitation.

One must interpret the experimental results on reward and punishment with considerable caution. What the experimenter described as "rewards" or "punishments" may have been interpreted quite differently by the subjects. Nevertheless, we can take certain cues rather definitely from the available research. First of all, we may be fairly sure that neutral responding — that is, reactions unaccompanied by some consequence such as reward or punishment, satisfaction or annoyance, or knowledge of correctness or error — is a wasteful form of activity. The things that count in learning are the things that matter in relation to wants and goals. Second, in Thorndike's words, "we may increase our confidence in positive, rather than negative learning and teaching." Learning takes place through the selection of satisfying responses — those which satisfy an individual's wants or constitute the means of attaining his goals.

RETENTION AFTER VERBAL LEARNING

Experiment and experience have so accustomed us to the rapid deterioration of the results of learning that we have become "philosophical" about the educational losses represented in curves of forgetting. We have come to consider it inevitable that people will forget almost immediately a large percentage of what they have learned and that the ultimate residue will be only a fraction of what was once memorized. Forgetting is an ever-present fact of human behavior to grapple with, but recent studies suggest that the extent of depreciation is not as serious or unavoidable as we once thought.

The "Ebbinghaus" Curve. It is true that the earlier investigations were discouraging. The dotted line of Fig. 18 is the retention curve which Ebbinghaus found in 1885 for

lists of nonsense-syllables.³⁷ At the end of the first hour, his subject had retained only about forty-four per cent of what he had learned, and by the end of the first day, the loss had reached two-thirds of the original material. After six days, retention had dropped off more slowly to about twenty-five per cent. Since these results were reported, numerous studies

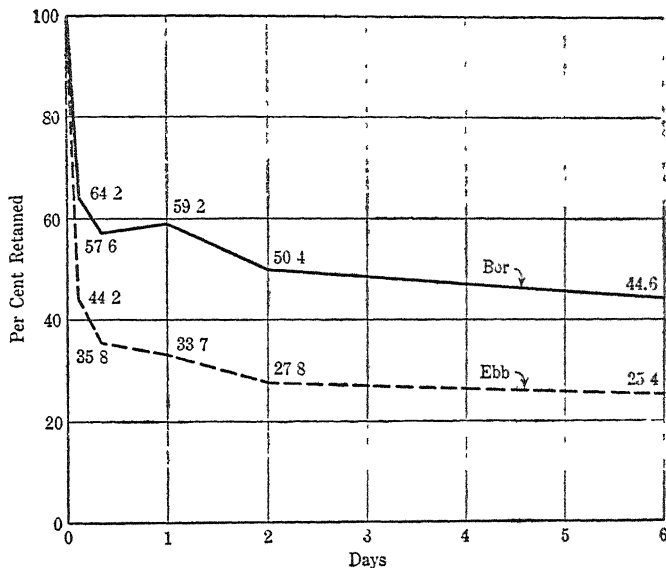


FIG 18 RETENTION AFTER DIFFERENT INTERVALS

Curve of retention of lists of nonsense-syllables, as determined by the saving method. The Ebbinghaus curve is from one subject about forty-four per cent of what he learned and relearned over 1200 thirteen-syllable lists. The Boreas curve is the average for twenty students, each learning one fifteen-syllable list for each interval. (Data from Ebbinghaus, 1885, and Boreas, 1930, after R. S. Woodworth, *Experimental Psychology*, Holt, 1938.)

of forgetting of nonsense material and of school subject matter have confirmed the general shape of the "Ebbinghaus curve," although the loss has been less in many instances, and the drop in the curve often less abrupt.

Overlearning and Forgetting. Ebbinghaus and many other psychologists have based their studies of forgetting on functions barely learned, usually to the point of one correct

repetition. Other experiments, however, have indicated that the rate at which forgetting occurs depends mainly on how strong the responses were at the beginning of the period — that is, on how much they were overlearned. Reactions greatly overlearned, such as our names, the alphabet, and many familiar words, or motor acts such as holding a pencil or humming “Home, Sweet Home,” will probably function after thirty, forty, or more years of disuse, although they will have lost more or less of the original promptness and ease of action. Names of old friends, the appearance of the scene of a summer’s vacation, a poem or song greatly overlearned, the act of catching a baseball, and other acts less thoroughly established will remain above the threshold of reaction for many years, and thus, by various degrees, we may come down to responses that were originally learned sufficiently to place them barely above the threshold of reaction.

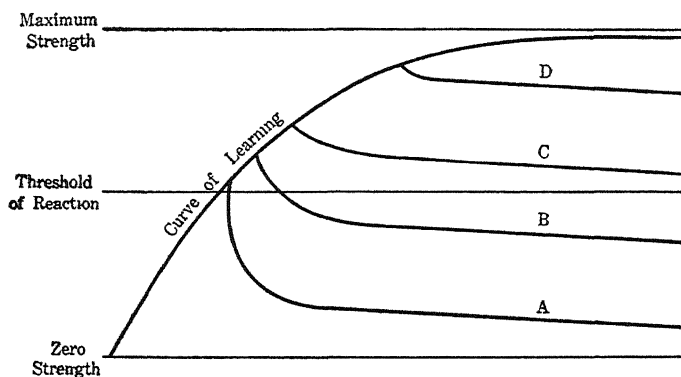


FIG. 19 PROBABLE INFLUENCE OF DISUSE IN THE CASE OF FUNCTIONS OVER-LEARNED IN VARIOUS DEGREES

Curve A shows the loss of forgetting which occurs when the function is barely learned. The initial loss is rapid and great, followed by a much slower rate of deterioration. B, C, and D show probable losses in functions which are overlearned slightly, considerably, and greatly, respectively. In all cases, after the rapid initial loss, the strength of the connections steadily but slowly decreases.

{Figure 19 illustrates roughly the probable curves of forgetting which may follow various stages of overlearning. These relations, however, are merely estimates. They are intended

to present roughly the general facts that the rate of loss through disuse depends upon the degree of learning and that loss goes on both above and below the threshold of response.

Retention in School Subjects. Many of the studies of retention in school subjects have shown large losses, even over the summer vacation. Nearly every college teacher of mathematics complains about his students' deficiencies in the elementary processes of both arithmetic and algebra. An analysis of poor test papers in a college class in statistics showed recently that the errors were due primarily to mistakes in arithmetical computation. In the elementary school, teachers usually devote the first weeks of each year to reviews of the previous year's work. Much of the research in educational psychology in recent years has been devoted to the development of techniques of diagnosis of deficiencies and means of remedial teaching. Many of the breakdowns in scholastic abilities, of course, are due to poor learning and teaching in the first place; others are the result of forgetting. We have room below for only a few illustrations of the retention studies in school subjects.

One class in 7B history had forgotten approximately one-eighth of the material at the end of four months; one-sixth in eight months; one-fourth in twelve months; and one-third in sixteen months.³⁸ After a three-month period, a college botany class lost 43.4 per cent of the information it had had at the end of the school year. By the end of six months, the loss reached 47.8 per cent. After fifteen and twenty months, the decrement amounted to seventy-four and seventy-six per cent, respectively. Students who possessed more botanical information at the end of the course retained, not only absolutely, but relatively, more of this knowledge after a lapse of three or six months.³⁹

Elementary school subjects seem to differ in their susceptibility to depreciation. Although the studies do not always agree, there has been a tendency for reading ability to suffer little or no loss, or even to show a slight gain, over the summer

months. Arithmetic reasoning has also held its own over the vacation. Deterioration has often appeared, however, in arithmetic computation, spelling, and specific factual data in the content subjects. One investigation of the retention of historical information as measured by the Van Wagenen American History Scale revealed material improvement rather than forgetting of easy material between spring and fall, although there was loss in the difficult material.⁴⁰ A study of the retention of knowledge over the summer vacation as measured by two administrations of the Stanford Achievement Test (an examination covering the principal elementary school subjects) revealed that eighth and ninth grade pupils suffered no serious loss with the possible exception of arithmetic computation. Fourteen of the twenty-two subtests showed small gains. The largest gain was in reading. Pupils with higher mental ages lost less and gained more than those with lower levels of mental development.⁴¹

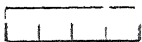
Retention of Different Learning Products. Recent developments in the appraisal of learning have thrown new light on the problem of forgetting by making possible studies of retention of different learning outcomes. Tyler, for example, attempted to determine whether information that is seldom used will be forgotten more quickly than explanations that can be commonly applied in everyday life and methods of thinking that can be employed in practical situations. He gave three tests in science, first in September, and then eight months later. They were the Ruch-Popenoe General Science Test (which is mainly informational), together with an explanation test and a generalization test which were constructed for the investigation. There was a distinct loss over the eight-month period in the factual Ruch-Popenoe test, but only a very slight difference in the scores on the explanation and generalization tests.⁴²

Comparable results in the same field were secured in another investigation.⁴³ In this instance, the ability to remember factual material, the ability to explain scientific

phenomena, and the ability to draw conclusions from data were measured. Retention was measured over the summer months. The greatest loss was in the ability to remember factual material, amounting to about seventeen per cent. Decrements in the other two powers were much smaller, amounting to only nine per cent in the case of the ability to explain scientific phenomena. In all three abilities, the losses were greatest for students in the lowest levels of intelligence.

Understanding and Retention. There is clear evidence that meaningful material is not only more easily learned than nonsense stuff, but that it is also remembered longer and more fully ⁴⁴ Now we have strong indications that understanding is much less susceptible to impairment than specific information. Not only do the two investigations reported above justify this hypothesis, but two others somewhat different in nature add substantial evidence to the point. One of these studies revealed that although the retention of verbatim statements decreased materially over the period of the experiment, the recognition of the substance of the passages either remained at the same level, or showed an actual gain. (See Fig. 20.) The results showed that it made little difference how many repetitions (from one to five) the subjects had. At the end of thirty days they could still recognize successfully the general idea of the passage. The number of repetitions, however, made a considerable difference in their ability to recognize verbatim sentences correctly ⁴⁵

The effect of understanding on retention was the subject of an investigation in which the subjects were asked to make

four squares out of five arranged in this fashion 

by changing the position of three sides. One group was repeatedly shown one solution for the problem as a means of memorizing it. Another comparable group was taught the principle by which this particular problem and others like it could be solved. The group which learned by understanding showed no loss, but a slight gain, in the ability to solve old

and new tasks over a four-week period. The subjects who had tried merely to memorize the solution showed a steady deterioration in both old and transfer problems.⁴⁶

The record for remembrance of general ideas and principles is a much more encouraging picture of the permanent results of education. These outcomes are probably of greater importance in life and in further schooling than the retention of

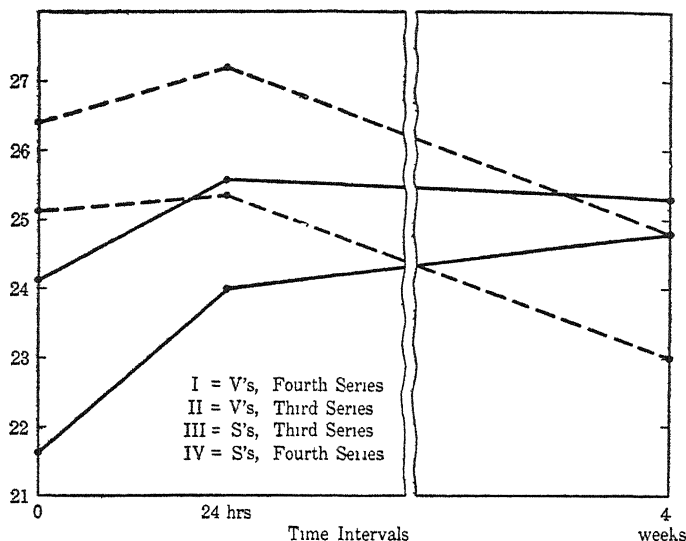


FIG 20. COMPARISONS OF VERBATIM AND SUBSTANCE MEMORY

The broken lines are for verbatim memorization, and the solid lines for the retention of the substance of the material (Adapted from H. B. English, E. L. Welborn, and C. D. Killian, "Studies in Substance Memorization," *J. of Gen. Psych.*, 1934, 11, 233-260)

great bodies of specific information. But here a word of caution is essential, for a great deal of "soft pedagogy" has grown up around an emphasis on broad understandings and a disparagement of factual learning. It is this: *An understanding of ideas and principles grows out of a wealth of specific data.* One may expect to forget much of the factual material in the end and retain the idea, but the idea cannot be acquired meaningfully without utilizing details at the time. Actually, if facts

are organized into meaningful relations and generalized into a principle, the details themselves are likely to be better remembered than if they were acquired in discrete fashion.

The Factor of Organization. In retention, as in many other aspects of the economics of learning, the factor of organization looms importantly. Analyses of the recall of stories have disclosed that the details which were remembered were those consistent with the meaning, or structure, which the persons originally got out of the narration. If they failed to sense the true plot, in successive attempts at reproduction they dropped out the persons, objects, or events which were inconsistent with their interpretation. Furthermore, details were modified, or added from previous experience, to round out whatever scheme was gleaned from the original story or constructed in the course of repeated efforts at recall.⁴⁷ These data reinforce our admonitions to make learning meaningful, and to establish the essential relations, or structure, of the task as a whole as clearly, accurately, and comprehensively as possible. Adequate organization in original learning makes for permanence and for exactness of recall. This principle was demonstrated recently in an examination of the retention of meaningful material, first when sleep followed original learning, and second, when waking activities intervened between learning and recall. Previous studies had indicated that retention was better after sleep than after additional waking activities. In this instance, however, the meaningful elements which were essential to the plots (organization) of the stories that were used as material were retained equally well in either condition; but nonessentials (details unnecessary or irrelevant to the organization) suffered considerably more from the influence of intervening activities than from sleep. The author concluded that "the structure of the story as a whole and the relation of the individual items to this structure are the determining factors which account for the difference found. . . ."⁴⁸ This is another instance of the dominance of a pattern as a whole over the constituent parts.

Retroactive Inhibition.⁴⁹ The experiment summarized immediately above is really one on the problem of retroactive inhibition. Psychologists once ascribed forgetting almost entirely to the effects of disuse and fading out of impressions. Now, however, they are inclined generally to the view that it is mainly the result of an active process of interference, or of interaction between old and the new learning. The fact that a child who learns 7 times 8 are 56 on Monday cannot recall it correctly on Friday may be due not so much to lack of practice on it between times as to the fact that he has learned other number facts in the interim which could somehow be confused with the first one. This sort of interference has been called retroactive inhibition.

Experimental studies of retroaction are arranged in such a way that the learner's achievement on the original task is measured directly after the first learning period, and also after a subsequent period during which some other material is learned. The material placed between the original learning and the retest on the original material is called "interpolated learning." Control subjects learn the same original material as the experimental ones, but substitute some sort of rest for the interpolated activity. "Rest" may have a variety of meanings, such as sleep, reading humorous magazines, or singing. The degree of retroactive inhibition can be determined by comparing the loss of retention on the part of experimental subjects with that of the controls. The purpose of retroaction investigations is to determine the conditions under which an activity may be expected to interfere with the retention of previous learning.

Unfortunately, little research on this problem has been conducted with the materials or under the conditions of schoolroom learning. Nevertheless, the results of laboratory studies have significant implications for educational procedure, some of which are indicated in the following partial summary of recent experimental evidence on retroactive inhibition.

1. *Similarity of original and interpolated activities.* Some retroaction may occur when original and interpolated activities are extremely dissimilar (in content, meaning, form, environment, method, etc.). As their similarity increases, retroaction also increases. This occurs to a certain point beyond which retroaction tends to decrease with further increase in similarity up to the condition of actual identity, where reinforcement may occur. Example: The probability that the date of an historical event will be remembered is greater if the next activity is the reading of narrative material concerning that event than if the subsequent task is learning more dates.

2. *Temporal position of the interpolated activity.* Interpolation immediately adjacent either to original learning or to its recall is likely to cause more interference than is interpolation well removed from the extremes. Which of the two extreme positions causes the greater detrimental effect is still uncertain. The implication here is that if one has reason to believe that certain learning activities are likely to interfere with the retention of previous learning, one should avoid placing the two tasks too close together. For example if certain French words are very similar in appearance or pronunciation, the teacher might do well to present them in context in different class periods rather than together in a word list.

3. *The degree of learning of the original activity.* The greater the degree of learning of the original material, the less susceptible will it be to interference. Accordingly, any procedure that will help one to learn better will also aid him to remember more efficiently. This should discourage the student who gives his work only cursory attention, intending to learn it better at a later time. At that later time, he is likely to find that intervening learning has disrupted his original insecure achievement, and that his previous "saving" of time has turned out to be an actual loss.

4. *The degree of learning of the interpolated activity.* The degree of interpolated learning seems to be positively, though not proportionately, related to the amount of retroaction up to a

certain maximum point, probably that at which the degree of learning of the interpolated material approaches that for the original activity. Application: If the teacher finds that only ten minutes of the class period remain for the development of a point not easily explained in less than half an hour, it would be wiser to leave it until the next class period. Poorly developed ideas presented hurriedly (as long as they fall short of a reasonable degree of mastery) are just the type of interpolated material which is likely to interfere with what was learned during the first part of the recitation.

5. *Familiarity with the material.* With increasing amounts of practice or previous experience with what is to be learned (both original and interpolated), the susceptibility to retroactive inhibition decreases. This principle should make teachers less impatient with their pupils' inability to grasp new concepts and generalizations as they are presented. The science teacher may read two new discoveries without confusion, because he has a broad background of understanding into which to fit the new knowledge. When he presents first one and then the other of these new discoveries to his high school class the next morning, however, their meager background may be insufficient for really understanding either one. The consequence is interference between the two concepts — that is, retroactive inhibition and low retention.

6. *Nature of the learning material.* Both verbal and motor activities are subject to retroactive inhibition, particularly the former. Both sense and nonsense materials are subject to retroaction, especially nonsense material.

Meaningful material, while apparently not so susceptible to retroaction as is nonsense material, seems to be most subject to retroactive inhibition when interrelationships are formed between original and interpolated tasks, as in the case of learning lists of adjectives so arranged that words in the second list are synonymous with those in the first list. When meaningful original learning is followed by unrelated interpolated activity, or when original learning is unrelated to meaningful

interpolated matter, there is less retroaction. In other words, when there are strong meaningful relationships within a body of material (either original or interpolated), the chances of retroaction are lessened.

Here is further support for those educational activities which stress meaning, understanding, and organization. Whatever aids the pupils to clarify their concepts and to organize and integrate their knowledge is just so much insurance against retroactive inhibition and forgetting. Example: A mass of unorganized facts about an author's life and writings is a fertile field for retroaction. The integration of those facts into a broad understanding of what that author's writings stand for, the influences which made him write in a particular way, and the basic ideas represented in his works presents a different psychological situation; the meaningfulness of the learning becomes a preventative of interference effects from subsequent activities, and retention is consequently better.

In general, those conditions which contribute to the construction of well-organized patterns of knowledge and skill reduce retroactive inhibition to a minimum.⁵⁰ Previous experience, meaningfulness of material, intelligence, and general maturity have such an effect. On the other hand, retroaction tends to increase under conditions that contribute to disorganization or confusion of original and interpolated learning materials. Similarity between original and interpolated activities (after a certain departure from identity), introduction of interpolated activity in close temporal proximity to original activity or to its attempted recall, and use of nonsense material are conditions with this negative effect. In the measure that the teacher guides pupils toward understanding and organization of knowledge around meaningful relationships, she is facilitating greater retention. In the measure that she presents work in disorganized, unrelated fashion, she is creating an ideal situation for rapid forgetting.

We repeat again that there is no one curve of forgetting. The amount and kind of forgetting depend upon many factors

involving the meaningfulness and organization of the material, the degree of original mastery, and the amount and character of interpolated activities. The permanence of schooling is in great degree a function of the quality of the initial learning

SUMMARY

Learning and recall are closely related activities. Whatever makes for effectiveness in learning facilitates retention. Rote learning or the memorization of nonsense material is more susceptible to deterioration than meaningful content. Discrete factual information is forgotten much more rapidly than coherently organized material. Information which is not used may be quickly lost, but well-understood and widely applied general ideas are retained much more successfully. Understanding the principle involved in the solution of a problem is one of the best means of remembering how to manage it at a later date; merely memorizing the steps in solution without understanding their rationale, on the other hand, is inviting poor retention.

In general, what is most thoroughly learned is most resistive to impairment. One should learn a given task well before going on to other activities, particularly if the subsequent ideas or responses are likely to be confused with the antecedent ones. The most important factor in learning for good retention is probably that of organization. One should relate what is to be learned into a coherent structure, or organize it in terms of some integrating principle, so that the individual items are carried, so to speak, by the intrinsic pattern. The membership relations within the unit will then be such that the recall of one component of the entire situation or activity will tend to reinstate the others with which it is functionally associated.

Whatever facilitates meaningful organization, therefore, not only makes learning more economical, but increases the probability that the product will be available in the future. Grouping is an effective learning procedure, particularly if it is based upon intrinsic relations. Learning by wholes,

utilizing the largest meaningful unit of which the individual is capable, takes advantage of the influence of organization. Active efforts to recall are useful because they establish the goal to be attained, provide practice in a realistic form, and assist in organizing the material into a compact pattern. Distributed practice in difficult tasks gives opportunity for seeing into the situation and perceiving essential relationships. Knowledge of progress, constructive diagnosis of difficulties, and systematic efforts to evaluate successive trials in the light of definite criteria or standards of performance contribute to the discovery and utilization of means-end relations. Rewards and punishment may provide significant information concerning the success or failure of responses, emphasize desirable or undesirable reactions, or cause the learner to discriminate between leading and irrelevant or misleading cues.

• The curriculum as a means of guiding learning should encourage the student to organize his ideas in systematic fashion. Several kinds of relationship are profitable. One of the most meaningful and useful frameworks for the organization of ideas, provided the system is really understood, is that represented in the logical structure of subjects or fields of knowledge. Still another important form of organization is that which integrates material from many sources as a means of making adjustments to significant life situations. The curriculum should never be composed of unrelated units whether of subject matter or of experience. Learning experiences should be related to one another horizontally, and they should also be sequentially organized so that a systematic body of ideas and activities will be continuously expanded into larger and more meaningful patterns. If the school stimulates the learner to develop new and purposeful relationships of his experiences, it will have succeeded in making his education meaningful and useful, more available in the future, and, as we shall see in the chapter on transfer of training, more capable of being applied in new situations.

QUESTIONS AND EXERCISES

1. Of the towns and cities you know which one has the best scheme for naming streets? Explain which one is superior by using a principle of learning developed in this chapter.
2. Criticize the use of "flash cards," that is, large cards of printed words that are "flashed" to view and quickly removed, as a means of increasing the span of perception of words in ordinary reading.
3. If you were to employ the "whole-part-whole" learning sequence, how would you teach a child?
 - a. a piano selection.
 - b. to make a dress.
 - c. a poem
 - d. the names of all the states.
 - e. to play baseball
4. Explain why learning to read German does not enable one to write it or to understand spoken German. Would it be wise to learn in one way or another according to our need to read, write, speak, or understand it when spoken?
5. Why is it that some people have difficulty in understanding a passage when they read it aloud to a group?
6. In some Chinese schools all the boys in a study room recite aloud and continuously. What are the advantages and disadvantages of this mode of study? Would you recommend it for our schools?
7. How would you teach a child to write better English compositions? Show how the principles offered in the chapter apply. Would it be worth while to have the student read or copy good compositions written by others?
8. Try this experiment on three different groups. Ask them to guess the length of time which passed between signals. You will say "Ready!" and in a moment "Now!" Then allow an interval of ten seconds, at the end of which you again say "Now!" The members of the group then write their estimate of the interval in seconds. Repeat with other intervals such as six, eight, fifteen, fourteen, ten, eighteen, nine, etc., until thirty trials have been made. With a second group, use the same intervals and the same number of trials, but after each trial say: "The time was more than ten seconds" or "less than ten seconds" as the case may be. To a third group, state the exact length of the interval after each trial. Compute the improvement for each group. Compare and explain the results.

9. Taking into account the facts concerning recitation versus rereading, the distribution of intervals in learning and review, the whole versus the part method of study, plan the most effective method of study for this course in psychology.
10. It has been said that in early life man gathers material to build a bridge to the moon. In middle life he uses it to make a woodshed. Interpret this in terms of *level of aspiration*.
11. Can you see any advantages in taking but few notes during a lecture and writing out a full account later, in comparison with taking very full notes during the lecture and reading them over later? Could you test these or other methods experimentally?
12. Try an experiment upon improvement in reading. For practice, attempt to speed up in your daily reading for thirty days. Give yourself a test, at about the same time each day, by getting someone to time you while you read for ten minutes as rapidly as you can comprehend. For test material use a book of moderate and uniform difficulty. Record the number of lines read on each ten-minute test. Plot a "curve of learning."
13. Compare your progress with that of others. At the end of thirty days, see if you think you have reached your limit. How can you be sure whether you are on a plateau or at your physiological limit? Test your judgment by continuing the experiment. Was the general curve uniform or irregular? Can you account for the small variations from day to day?
14. James states that "Nothing we ever do is in strict scientific literalness wiped out." Just what is meant by this? Certainly, experiences are "forgotten," that is, cannot be recalled consciously. What has become of them and how may they function? What evidence can you cite to show that some trace of past experience may function years after it is forgotten in the sense that it cannot be consciously recalled?
15. List some instances in your own school experience in which interfering activities greatly affected learning or remembering. Cite other instances when retroactive inhibition was minimal. Discuss the particular nature of the retroactive inhibition in each case.
16. How is a child's level of aspiration related to his degree of motivation? Under what circumstances may his level of aspiration be too high? Too low?
17. It has been said concerning learning, "Easy come, easy go." Cite evidence from this book or other sources to reveal the

fallacy in such a statement Under what conditions may such a statement be true?

18. Why is it a useful rule in preparing assignments to read and study an outline of the chapter both before and after reading the contents?

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Woodworth, R. S, *Experimental Psychology*, Holt, 1938, Ch. 9

It is worth while to supplement a general knowledge of the learning process with a more extended acquaintance with the psychology of learning in subject matter fields The following chapters deal with the psychology of language including the vernacular and foreign language, the fine arts; the natural sciences; and the social sciences

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Index of Authors for Volume 1

- Abel, T M , 195, 223
 Allport, G W , 312, 315, 322, 323
 Anderson, J E , 78, 213, 220, 224, 245,
 255, 296, 299, 322
 Andrew, D M , 276
 Appel, F S , 317, 323
 Arndt, C O , 220
 Arps, G F , 267, 294
 Arsenian, S , 191, 223

 Baker, Harold V., 194, 223
 Baldwin, B T , 49, 52, 78, 230
 Bartlett, F C , 411, 423
 Barton, J W , 356, 370, 376
 Barton, W A , 392, 422
 Bassett, S J , 407, 422
 Bayley, N , 79
 Bell, J , 102, 120
 Benezet, L P , 34, 47
 Bentley, J E , 293
 Bienstock, S F , 29, 35, 46, 47
 Bills, A G , 364, 365
 Binet, Alfred, 226, 227, 228, 229, 230,
 232, 233, 234, 235, 236, 237, 248,
 253, 256, 257, 258, 262, 263, 265,
 287, 291, 293, 294
 Bingham, W V , 293
 Bird, C , 322
 Blatz, W E , 133, 168
 Blonsky, P P , 182, 221
 Bode, B H , 335, 336, 346, 348
 Bond, E A , 263, 294
 Bond, G L , 269, 294, 304, 305, 323,
 395, 397, 422
 Book, W F , 376, 420
 Boreas, Th , 405
 Bott, H , 184, 222
 Boynton, P L , 293
 Brace, D. K. , 58, 59, 80, 275
 Brian, C R , 72, 81
 Bridges, K. M. B. , 84, 119
 Brink, W. G , 420

 Brooks, F D . 78, 220, 407, 422
 Brownell, W. A , 221, 307, 323, 334, 348
 Brueckner, L J , 220, 293
 Brumbaugh, F , 111, 112, 121
 Bryan, W L , 369
 Buhler, C. S., 119, 166
 Burke, A , 267, 293
 Burks, B S., 242, 254
 Burnham, W. H , 118
 Burt, C , 195, 196, 223, 254, 259, 262,
 268, 269, 293, 294
 Buswell, G T , 347

 Caille, R. K., 145, 169
 Caldwell, O. W , 153, 170
 Calkins, L. A , 21, 46
 Campbell, E H , 166
 Cannon, W B , 88, 89, 118, 120
 Carmichael, L , 78, 44, 45
 Carroll, H A , 16, 254
 Cattell, J Mc , 9
 Challman, R C , 126, 143, 168, 169
 Charles, M W , 133, 168
 Chazal, C B., 307, 323
 Clark, E L., 293
 Clark, M , 386, 421
 Coghill, G E , 27, 45, 46
 Communs, W. D , 16, 375
 Conel, J L , 78, 45
 Conklin, E S , 16
 Conrad, H S , 118, 240, 254
 Cox, W W , 276, 294
 Cunningham, B. V , 280

 Dale, E , 221
 Dashiell, J F , 324, 328, 347
 Davis, E A , 188, 190, 222, 223
 Davis, R A , 375, 408, 423
 Dawe, H C , 143, 146, 169
 Dawson, G E , 221
 Dennis, W , 128, 168
 Deshaies, L , 195, 223

- Deutsche, J M, 195, 221, 223
 Dewey, John, 310, 311, 313, 317, 323,
 331, 345, 347, 386, 389, 421
 Dollard, J., 119, 166
 Doob, L, 119, 166
 Douglas, O B, 16
 Dudycha, G J, 182, 221
 Dudycha, M. M., 182, 222
 Dunn, F. W., 221
 Dwyer, F M, 78

 Ebbinghaus, H, 226, 404, 405
 Eisenson, J, 293
 Ellis, A. L, 355, 376
 English, H. B., 16, 409, 410, 423
 Eskridge, T J, 308, 323
 Espenschade, A, 57, 58, 61, 63, 79, 80
 Eurich, A C., 16

 Faegre, M. L., 78
 Fay, P J, 78
 Fendrick, P, 269, 294
 Ferson, M L, 276
 Fite, M D, 129, 147, 153, 155, 166,
 168, 169, 170
 Fleming, C W, 247, 255
 Forlano, G, 391, 392, 422
 Foster, J C, 78, 79, 213, 224
 Foster, S, 119
 Frank, J D, 399, 422
 Frederick, R W, 346
 Freeman, F N, 15, 61, 62, 78, 80,
 243, 253, 255, 375
 Freeman, F S, 16
 Frogner, E, 330, 347
 Furfey, P H, 125, 143, 166, 168, 169

 Garrison, C G, 267, 293
 Gates, A I, 3, 29, 33, 46, 47, 65, 80,
 92, 120, 279, 293, 294, 304, 305, 323,
 357, 354, 376, 390, 395, 397, 420, 421,
 422
 Gates, G S, 84, 119
 Germane, E, 392, 422
 Gesell, A, 27, 44, 45, 46, 55, 78, 80,
 84, 119
 Giesecke, M, 62, 80
 Gilliland, A. R., 293
 Goldman, B, 158, 171
 Goodenough, F L, 72, 78, 81, 83, 84,
 92, 93, 119, 120, 244, 255
 Gray, W. S., 220, 304, 323

 Green, E H, 146, 148, 169
 Green, G. H., 206, 220, 224
 Greenberg, P J, 149, 170
 Griffith, C R, 16, 375
 Griffiths, R, 206, 220, 224
 Guilford, J P, 377, 378, 420
 Gutteridge, M V, 72, 79, 81, 184, 222

 Hagman, E P, 126, 143, 168, 169
 Hagman, R R, 96, 120
 Halverson, H M, 54, 79
 Harrower, M R, 214, 221, 224
 Harter, N, 369
 Hartmann, G W, 341, 348
 Hartshorne, J, 221
 Hattwick, B W, 155, 170
 Hazlitt, V, 195, 223
 Heidbreder, E, 16
 Heiliger, L, 35, 47
 Henle, M, 193, 223
 Hertzberg, O E, 354, 376
 Hildreth, G., 247, 255, 375
 Hilgard, J R, 28, 46, 302, 322
 Hoban, C F, Jr, 221
 Holaday, P W, 221
 Holland, B F, 16
 Hollingworth, H L, 38, 44, 47, 65, 81,
 118
 Hollingworth, L S, 119, 154, 166,
 170, 247, 248, 254, 255, 261, 268,
 293, 294
 Holmes, F B, 85, 86, 96, 97, 103, 117,
 119, 120
 Holzinger, K J, 243, 255
 Horan, K M, 248, 255
 Horn, E, 220, 310, 323, 388, 421
 Hubbell, M B, 193, 223
 Hull, C L, 293
 Hunt, T, 276
 Hunter, W S, 420
 Hurlock, E B, 182, 221

 Ilg, F L, 55, 78, 80
 Irwin, O C, 78, 45
 Isaacs, S, 119, 166

 Jack, L M, 156, 170
 Jackson, C M, 21
 James, William, 19, 45, 419
 Janney, J. E, 16
 Jenkins, L M, 57, 79, 80
 Jennings, H, 153, 170

- Jensen, K., 78, 45, 220
 Jensen, M. B., 387, 421
 Jersild, A. T., 29, 33, 35, 46, 47, 78, 85,
 86, 89, 96, 97, 103, 108, 111, 119, 120,
 123, 129, 146, 147, 153, 155, 158, 166,
 167, 168, 169, 170, 171, 187, 202,
 210, 220, 222, 224, 303, 323
 Jersild, C. L., 97, 120, 158, 171
 Johnson, M. W., 157, 166, 170
 Johnson, P. O., 407, 423
 Jones, H. E., 96, 118, 120, 240, 254
 Jones, M. C., 96, 119, 120
 Jones, T. D., 30, 47, 55, 77, 80, 81
 Judd, C. H., 9, 16, 388, 420, 421
 Justin, F., 177, 121
- Kao, Dji-Lih, 377, 376
 Katona, G., 380, 410, 421, 423
 Keister, M. E., 156, 170
 Kelley, T. L., 199, 221, 223, 234
 Killian, C. D., 409, 410, 423
 Kilpatrick, W. H., 388, 421
 King, L. M., 287, 294
 Kohler, W., 325, 347
 Kolberg, O. W., 408, 423
 Kopel, D., 352, 376
 Kotinsky, R., 389, 421
 Krey, A. C., 199, 221, 223
 Kuhlmann, F., 228
- Landis, C., 118
 LaRue, D. W., 16
 LaSalle, D., 78
 Laton, A. D., 752
 Leahy, A. M., 242, 255
 Learned, J., 35, 47
 Lederer, R. K., 62, 80
 Leeper, D. O., 336, 348
 Leeper, R., 375, 323, 336, 348
 Lehman, H. C., 68, 79, 81
 Lemaire, A., 387, 421
 Leuba, C., 149, 169
 Levy, J., 119
 Lewin, K., 399, 422
 Lewis, D., 277, 294
 Lindbergh, A., 313
 Lindbergh, C., 313
 Lippitt, R., 157, 167, 171, 298, 322
 Lislett, L. R., 408, 423
 Loftus, J. J., 158, 171
 Lowenstein, P., 156, 170
 Luria, A. R., 277
- Lyman, R. L., 221
- MacQuarrie, T. W., 274
 Maller, J. B., 149, 170
 Manwell, E. M., 156, 170
 Markev, F. V., 97, 120, 123, 146, 167,
 169, 206, 224
 Marquis, D. P., 25, 46
 Mav, M. A., 221
 McAdory, M., 275
 McCarthy, D., 186, 188, 221, 222
 McCloy, C. H., 57, 80
 McConnell, T. R., 12, 334, 346, 347,
 348
 McCurdy, J. H., 60, 80
 McGeoch, G. O., 387, 383, 421
 McGraw, M. B., 20, 25, 26, 28, 30, 31,
 44, 45, 46, 47, 302, 323
 McKee, P., 220
 McKim, M., 278, 294
 McKinror, K., 136, 139, 152, 167,
 169, 170
 McLellan, F. C., 25, 46
 Meek, L. H., 78, 119, 126, 167, 168,
 358, 376, 395, 422
 Meier, N. C., 78, 220, 275
 Meigs, M. F., 108, 120
 Melton, A. W., 342, 346, 348
 Meltzer, H., 783, 198, 199, 222, 224
 Mengert, I. G., 139, 156, 169, 170
 Merrill, M. A., 227, 254, 257, 258, 293
 Miller, N., 166, 199
 Millichamp, D. A., 133, 168
 Mitchell, B. C., 243, 255
 Moore, T. V., 196, 223
 Moreno, J. L., 144, 167, 169
 Moss, F. A., 276
 Mowrer, O., 119, 166
 Muenzinger, K. F., 328, 347, 403, 422
 Murchison, C., 18, 44, 45, 166, 186,
 221, 222
 Murphy, G., 16, 167, 220
 Murphy, L. B., 118, 123, 140, 167, 168,
 169, 220, 297, 298, 322
 Mursell, J. L., 16
 Myers, G. C., 188, 222
- Nelson, A. K., 78, 45
 Nelson, E., 204, 224
 Nestrick, W. V., 77, 81
 Newcomb, T. M., 167, 220
 Newman, E. B., 411, 423

- Noble, E L , 267, 294
 Northway, M L , 384, 421

 Oakden, E C , 200, 224
 Oden, M , 154, 170
 Omwake, L , 111, 121
 Orleans, J B , 277, 294
 Orleans, J S , 276, 277, 294
 O'Rourke, L J , 274
 Osborne, E. G., 72, 81, 167

 Panlasigui, I , 400, 422
 Paterson, D G , 229
 Pearson, K , 239, 240, 254
 Pechstein, L. A. , 381, 421
 Peterson, J , 253
 Peterson, R C , 221
 Piaget, J , 195, 223
 Pintner, R , 229, 254, 280, 293
 Pistor, F , 34, 47, 201, 224
 Point, A , 229
 Popenoe, P B , 408
 Porteus, S D , 229
 Pratt, K C , 18, 45
 Prescott, D A , 118, 322
 Pressey, L C , 198, 199, 223
 Pressey, S L , 16, 198
 Preston, R , 204, 224
 Pritchard, M C , 248, 255
 Proctor, W M , 259, 260, 293

 Ragsdale, C. E , 346, 376
 Rebello, S , 200, 224
 Reed, H B , 409, 423
 Reynolds, M M , 145, 169
 Ritzman, R , 187, 222
 Roberts, K E , 333, 347
 Roberts, L J , 79
 Rogers, F R , 275, 294
 Rosenblatt, L M , 322
 Ruch, G M , 408
 Ruckmick, C A , 84
 Ruger, H A , 179, 180
 Russell, D H , 304, 305, 323
 Russell, N M , 338, 348
 Rust, M N , 145, 169, 245, 255

 Saetveit, J G , 271, 294
 Salisbury, R , 330, 346, 347
 Salusky, A S , 130, 168
 Sandiford, P , 16
 Sawdon, E. W , 384, 421

 Scammon, R E , 21, 46¹
 Scheidemann, N V , 293
 Schneider, E , 221
 Schrepel, M , 408, 423
 Schwartz, R , 182, 221
 Scott, A W , 65, 80
 Scott, F , 188, 222
 Seagoe, M V , 143, 169, 382, 383, 421
 Sears, R , 119, 166
 Seashore, C E , 271, 272, 273, 275, 281, 294
 Shaffer, L F , 347
 Sherman, I C , 22, 46
 Sherman, N , 22, 46, 83, 119
 Shirley, M. M , 27, 45, 46, 53, 54, 79, 86, 120, 128, 136, 167, 168, 169, 186, 222
 Shuttleworth, F. K , 50, 51, 79
 Simon, T., 226, 227
 Skeels, H M , 190, 223, 245, 255
 Skinner, C. E , 16, 376
 Skodak, N , 243, 255
 Smith, M E , 186, 222
 Snoddy, G. S , 366, 376
 Sorensen, H , 16
 Spearman, C E , 234, 235, 254
 Stanger, M , 247, 255
 Stanton, M , 293
 Starch, D , 369
 Stecher, L I , 230
 Stenquist, J L , 274
 Stern, L W , 252
 Stoddard, G. D , 221, 254, 276
 Stolz, H R , 126, 168
 Strang, R , 78
 Strayer, L C , 33, 47, 189, 223, 302, 323
 Stroud, J B , 16, 347
 Sturt, M , 200, 224
 Sun, K H , 18, 45
 Svendsen, M , 156, 170
 Swenson, E J , 472, 423
 Swift, E J , 366
 Symonds, P M , 119, 167, 277

 Taylor, G A , 29, 46, 354, 376
 Terman, L. M , 9, 153, 154, 170, 227, 237, 248, 253, 254, 257, 259, 260, 278, 287, 293, 294
 Thayer, V T , 389, 421
 Thiele, C L , 334, 348
 Thomas, W. S , 89, 120

- Thompson, H , 27, 44, 46
Thomson, G H , 234
Thorndike, E. L , 9, 234, 235, 254,
327, 328, 340, 346, 347, 366, 394,
401, 402, 403, 404, 422
Thorndike, R L , 158, 171, 247, 255
Thurstone, L L , 221, 234
Trow, W C , 16
Tyler, R W , 408, 423

Updegraff, R , 35, 47, 156, 170, 190,
223, 245, 255

Van Alstyne, D , 184, 190, 222, 223
Vanuxem, M , 254, 264, 265, 294
Van Wagenen, M J , 408

Watts, J V , 402, 422
Ward, A H , 408, 423
Washburn, R W , 111, 121
Waters, R H , 355, 376

Watson, B , 415, 423
Welborn, E. L , 409, 410, 423
Wellman, B L , 63, 80, 743, 753, 160,
170, 190, 223, 244, 245, 247, 255
Williams, A M , 209, 221, 224
Williams, H M , 190, 223, 245, 255
Williams, J F , 60, 79, 80
Wittv, P A , 68, 79, 81, 352, 376
Wohlgemuth, A , 183, 222
Wood, B D , 254
Woodworth, R S , 16, 361, 369, 376,
381, 385, 392, 394, 405, 420, 421,
422
Worcester, D A , 386, 421

Yerkes, R M , 265, 267, 294
Yoakum, G A , 392, 422
Young, P T , 322

Zachry, C B , 389, 421
Zyve, D L , 276

Subject Index for Volume 1

- Abilities, in relation to interests, 37, 66-67, of leaders, 151, 153, 267, special, 270-277, spontaneous use of, 37
- Abstract ideas, 174, 233, 236-237, 263, 285, 286-288
- "Accomplishment quotient," 283
- Accuracy, 373
- Achievement, 149, 257, 269, 274, and intelligence, 158-263, measurement of, 232, 256, 283, 290
- "Activity" program, 388-389, 394, 396
- Adjustment, problems of, 106, 114-116, 269, 291, *see* Personality adjustment, Social adjustment, Emotional adjustment
- Adolescence, 56, 67, 76, 112, 126, 160, effect of stature in, 53, emotional problems of, 96, 143, sex differences in, 60-61, 74
- Adrenal glands, 88-90
- Adult-child relationships, 109-111, 208
- Adults, 97, and utility of childhood skills, 70, 76, emotional expression of, 89-90, 146
- Affection, 109-111
- Aggression, 132-134, 145-148, 157, 297, frustration, 147, 161
- Aiding adjustment, *see* Treatment
- Algebra, 277-278
- Anger, 82, 91-95, 112-115, expression of, 39, 83-88, in children's social relations, 56, 113, value of, 94
- Annoying effects, 92, 328, 403-404
- Anticipation, 173, in development, 37
- Anxiety, 87, 103, 116, 213
- "Approximation and correction," principle of, 342
- Aptitudes, measurement of, 256-267, 271-291
- Arithmetic, 106, 278, 285, insight in, 333-335, 388-389, instruction in, 34, 217, 258, 263, 307, 310, 341; retention of, 407
- Army intelligence tests, 229-231, 265-267
- Artistic capacities, 275, 282
- Aspiration, 91, 155, level of, 397-400
- Association, 98, 177-178, 340, 344, 380, in correlation, 239
- Attention, 184-185, 216, 369, to errors, 359
- Attitudes, 306, 311, 314, relation of, to information, 203-205, 218, toward learning, 394, 396-397
- Auditory, acuity, 179, 281, defect, 229, 231, 250
- Autocratic versus democratic management, 157-159, 161-162, 298
- Autonomic nervous system, 88
- Behavior, development of, 17-47, 140
- Behaviorism, *see* Conditioned response psychology
- Binet-Simon Scale of Intelligence*, 226
- Birth, behavior before, 17, behavior after, 19, 40-41
- Bladder control, 24-25
- Bodily changes, in emotion, 88-90
- Bodily proportions, 22, 31, 48-53
- Brace Motor Ability Tests*, 275
- Capacity, 257, 263, 270, *see* Intelligence, Aptitudes
- Cephalo-caudal sequence of development, 22, 41, 73
- Cerebral cortex, 25, 41
- Classification of pupils, 249, 284
- Classroom groups, 289-290

- Companionship, influence on mental growth, 246
- Compensation, in motor skill, 358, principle of, 65
- Competition, 96, 138, 148-151, 162-163, 297
- Comprehension, *see* Meanings, Understanding
- Concepts, 193-203, abstract, 198-200, 217, development of, 34, 42, 308, 338; moral, 213-215, number, 334, 337, of cause and effect, 195-197, of time and space, 34, 173, 197, 200-201, 217, *see* Abstract ideas, Meanings
- Conditioned response psychology, 11
- Configuration, 351
- Connectionism, 11
- Constancy, of intelligence quotient, 233, of personality traits, 136-138
- Contiguity, influence of, 340, 401
- Cooperation, 138, 150-151, 160, 162, 245, 297
- Coordination, *see* Motor development
- Correlation, 65, 238-241
- Coxe-Orleans Prognosis Test of Teaching Ability*, 276
- Culture and customs, 130
- Curriculum, 185, 304-305, 319, 341, and recreation program, 64, 70-71, child's early, 17, 24, experience, 260, 386-389, 394, subject, 388-389, 394;
- Curves, fluctuations in, 371, of forgetting, 404-407, 415-416, of learning, 364-373; plateaus in, 368-371
- Daydreams, 205-212, 216, 395
- Deductive reasoning, 196
- Defense reactions, 395
- Delinquency, 268-270
- Democratic procedures, effect of, 298, *see* Autocratic versus democratic management
- Detroit Mechanical Aptitude Examination*, 274
- Development, child, 17-223; effect of, on skills, 30-33, 55, individual differences in, 42, learning as, 344, mental, 172-224, of behavior, 17-47, 175, of hand preference, 62, of prehension and locomotion, 54, of sense of humor, 111-112, uniformity in, 35-36, *see* Motor development, Emotional development, etc.
- Developmental direction, law of, 21, 41, 54
- Diagnosis, 358, 371
- Diagnostic inventory or test, 278-282, 289
- Differentiation, anatomical, 21, 73, in learning, 337-339, 343, in mental growth, 172, of behavior, 18-21, 41 of emotional expression, 84-85, 113 of sense impressions, 177, 215
- Disabilities, 283-284, 351, 356, 358, 395-397
- Discrimination, 338, *see* Sensations, Perception, Differentiation
- Discussions, adults', 192-193, children's, 158-159, 161, 192
- Dishonesty, 214-215
- Distribution, of intelligence, 257, of practice, 349, 366, 372, 393-394
- Drawing, 263, children's, 178
- Dreams, 212-213, *see* Daydreams
- Drill, in curriculum, 92, 307, 317, 344, 362
- Education, 282, effects of, 244-251, method in, 295, 386-389
- Educational psychology, present status, 3-16
- Effect, law of, 327-328, 400-404
- Efficiency, in learning, 349, influence of emotion on, 90
- Egocentricity, 193-197
- Emotion, 311, defined, 82, 112
- Emotional adjustment, 395
- Emotional behavior, 36, 73, development of, 38-39, 42, 82-121, *see* Expression of emotions
- Emotional difficulties, 395, 399
- English teaching, 316-317, 329-330
- Environment, 172-173, influence of, on language, 189-191, on learning, 296-297, on skills, 71-72, on social behavior, 129-130, 155-156; *see* Heredity and environment
- Escape mechanisms, 205-212, 216; *see* Withdrawal
- Experience, curriculum, 260, 286-289, 394

- Expression of emotions, 39, 83-84, 93, 100, 118; decline of, 85-88, 114; in infancy, 83-85, indirect, 93, 206, 213
- Eye movements, 350-352
- Factual material, 409-411, 416, *see* Information
- Failure, 267; scholastic, 258-261, 269, 394-397
- Fear, 82-90, 95-103, 113-114
- Feeble-mindedness, 238, 258, 264-265, 269, *see* Mental deficiency
- Flexibility, in performance, 357-358, 373
- Form, value of, in learning, 377-380
- Foster children, 242-243
- Friendship, 139, 142-145, 160, 162
- Frustration, 148, 394-397; and juvenile delinquency, 269-270
- Functional consequences, 328
- Generalization, 334-335, 344
- Generalized response or activity, 18-21, 41, 73, 84, 339
- Geography, 308, 388, *see* Social studies
- Gestalt psychology, 11
- Gifted children, 154, 239, 247-248, 258, 261-262, 268, 270, 285, 383, 399
- Goals, in learning, 296, 299, 317-320, 325-331, 342, 349, 352, 385, 392, 404
- Grammar, 190, 330-331
- Group behavior, 123-125, 144, 149, 160, 190, 197
- Grouping tests, 229-232, 250
- Grouping, as learning aid, 379-380; *see* Organization
- Growth, curves of, 49-52, 230, mental, 172-224, 225, physical and anatomical, 21, 48-81, 73, readaptation of skill after, 30-31; *see* Maturation
- Guidance, and motor skills, 71-72, 349-376, and social adjustment, 134-138, educational, 286, 290-291, 399, in classroom activity, 159, 307, 319, 371-372, principles of, in learning, 349-423, vocational, 107, 276-277, 286, 399; *see* Vocational guidance
- Habits, 32, 369
- Handedness, development of, 62-63, 74
- Handicapped individuals, 229, 231
- Handwriting, guidance in learning of, 61-62, 263, 353-355, 367
- Height, growth in, 48
- Heredity, and environment, 133, 225-226, 312, influence on handedness, 62-63, influence on intelligence, 236-251
- History, 263, 285, method of teaching, 341, 388, *see* Social studies
- Hobbies, 208-212
- Homogeneous grouping, 284-285, *see* Classification
- Humor, 111-112
- Hunger, 103, 312
- Hyperactivity, 324
- Ideas, 338, 344, 350, 384, *see* Abstract ideas, Concepts
- Idiots, 258
- Imagination, 93, 172, 206, 216, as source of fear, 96
- Imbeciles, 258
- Improvement, in motor skills, 70-72, 358-362, knowledge of, 400, rate and limits of, 280-281, 364-376; *see* Learning
- Incentives, 314-318, 368, 400, praise, 107-109, 397
- Individual differences, between Dionne quintuplets, 168, in emotional reaction, 84, 88, 96, in handedness, 62, in information, 201-203, 217, in intelligence, 64-66, 225, 238-252, 256-258, 268, 285-286; in interests, 268, in language development, 64, 186, in motor development, 54, 64, in rate of development, 42, in social response, 131-136, 140-141; in special abilities, 106; in sustained attention, 184, 216
- Individuation, 21, 45
- Inductive reasoning, 196
- Infant behavior, *see* Behavior after birth
- Information, 193-197, 201-205, 218, 367, 387, 388, 408
- Insecurity, feelings of, 149
- Insight, in learning, 331-335, 343, 352, 361

- Instruction, *see* Guidance in learning
- Integration, 337-340, 343, 381, 383, 384, 389, *see* Organization
- Intelligence, 225-255, and loquacity, 187, and personality traits, 154, 163, 281, defined, 237, 250, measurement of, 172, 225-255, relation to motor ability, 64-65, 266, 270, 366, relation to scholastic achievement, 258-263, 281, relation to vocational success, 263-267, 281
- Intelligence quotient, 230, 233-234, 237, 244-251, 256-270, 283
- Interests, 142, 206-212, 268, and intelligence, 247, and personality adjustments, 107, 176, and success, 154, 394-395, related to motives, 312-318, stimulation of, 296-297, 372, 394
- Interrelatedness of learning products, 335-336
- Irradiating effect, 401
- Isolated child, *see* Social adjustment
- Jealousy, 91, 115, 148
- Knowledge, 188, 199-200, 244, 306, and loquacity, 187, of effective performance, 350-352, 392, 400; *see* Meanings
- Kuhlmann Test of Mental Development*, 228
- Language, 33, 229; development of, 122, 175, 183, 185-192, 217
- Laughter and humor, 111-112
- Law, of developmental direction, 21, 41, 54, of disuse, 412, of effect, 327-328, 400-404
- Leadership, 124, 151-155, 163, and intelligence, 154, 163, 267-268, 286
- Learning, age for effective, 33-35, 302-303, and motivation, 311-320, as adjustment, 335, 338, as process, 306-309, characteristics and curves of, 364-373, distinguished from growth, 23-26, 41, 189-190, 301-303, motor skills, 28-29, 42, 303, 308-309, 349-376, nature of, 295-348, needs and opportunities for, 296-299, organized, 386-389, 408-411; principles of guidance in, 15, 41-42, 295, 307, 349-423, relation of, to intelligence, 225, 258-265, 270, relation of, to reasoning, 467-470, rote, 300, 324, 333-334, 344, 390, 392, 416, transfer of, 332-335; *see* Improvement, Practice
- Level of aspiration, 397-400
- Locomotion, development of, 53-54
- Logic, 122, 217
- McAdory Art Test*, 275
- MacQuarrie Test of Mechanical Ability*, 274
- Maladjustment, *see* Adjustment problems
- Manipulation, 325, *see* Motor development
- Manual guidance, 353-355
- "Mass" activity, *see* Generalized response
- Maturation, and intellectual development, 32-35, 174, 200-201, and learning, 23-27, 30-35, 41, 127, 301-303, and motor skill, 27-29, neural, 25, 182, 215
- Maze learning, 229, 336
- Meaningful activities, 331, *see* Goals in Learning
- Meanings, 306-308, 333-335; and retention, 408-411, 414-415, as learning aid, 386-387; word, 187-189, 217, 307-308
- Means-end relations, 328-331, 342-344, 349, 358
- Measurement, 226, of intelligence, 225-255
- Mechanical ability, 266, 270-271, aptitude, 274-275, 282. *see* Abilities
- Meier-Seashore Art Judgment Test*, 275
- Memorizing, *see* Learning
- Memory, 34, 181-183, 215-216; for the pleasant and unpleasant, 183, *see* Retention
- Menarche, relation of, to growth, 48-53
- Mental age, 232-233, 250, 256, 283, 287
- Mental deficiency, 64, 242, 258, 285, *see* Feeble-mindedness
- Mental development, 36, 42, 64-66, 75, 172-224, 230; and play activity, 66, as learning, 295

- Mental set, 315
 Mental tests, *see* Measurement
Merrill-Palmer Scale, 228
 Methods, of dealing with anger, 94-95; of psychology, 4-5, *see* Guidance
Minnesota Mechanical Ability Tests, 274
Minnesota Preschool Scale, 228
 Models, use of, in learning, 352-353, 372
 Moral, adjustments, 268-270, 281; code, 214-215
 Motion pictures, 207-212, 216, 353, 372
 Motivation, 311-320, 324, 349, 371
 Motor development, 42, 48, 54-81; and play activities, 66-73, necessary for handwriting, 61, sex differences in, 60-61, 74, *see* Skills
 Muscles, 61, 88-89, 360
 Muscular tension, 361
 Musical aptitude tests, 271-274, 282
- Nature and nurture, *see* Heredity and environment
 Needs, 299, related to interests, 297
 Negativism, 101, 123, 145-146, 161, 245, 394
 Nervous system, 88, 235, *see* Maturation, neural
 Nursery school, experience, effects on intelligence, 244-246, effects on social development, 129, 139, 155-156
- Objective methods, 4-5
 Observation, learning by, 352-353, 427
 Obstructions, as causes of anger, 91-92, 113, as stimulus to thinking, 471, in course of learning, 324, *see* Frustration
 Occupation, *see* Vocational guidance
 Organism, as a whole, 335
 Organismic psychology; *see* Gestalt psychology
 Organization, 226, 336, 416-417, and the curriculum, 386-389, in learning, 332, 335-337, 342-344, 349, 365, 368-371, 377-386, 411, 415-416; of abilities, 237, of ideas, 172, 339; of skills, 41, 344, 356-357, 368-372
- Orleans Algebra Prognosis Test*, 277
O'Rourke Mechanical Aptitude Test, 274
 Outcomes, *see* Results
 Outlining, as learning method, 392
 Overlearning, 405-407
 Overprotection, 73
- "Pacing" in learning, 370; *see* Readiness
 Parent, 17, 56, 110, 145, and child resemblance, 238-240; influence on child's adjustment, 149; influence on child's fears, 99; influence on child's moral code, 214-215, influence on child's prejudices, 204-205
 Part versus whole learning, *see* Whole versus part methods
 Pattern, emergence of, 326, 373, 378, of action, 356-357, of behavior, 82, of growth, 48, 73, of ideas, 384
 Perception, 172, 177-181, 217, 342, 352, 426, of relations, 325-326, 336-337, of symbols, 351; of the goal, 358
 Performance, learning by actual, 354-357, 370, 372, 385-386; tests of, 229
 Personality, and habits of speech, 192, and intelligence, 154, 268, development of, 123, problems, 395, traits, 275, 291, *see* Adjustment
 Phantasy, *see* Daydreams
 Physical capacities, 275
 Physically handicapped child, *see* Handicapped individuals
 Physiological limit, 367-368
Pitner-Paterson Scale of Performance Tests, 229
 Plateau, 368-371, 373
 Play activities, 130, 149, 184; and motor development, 66-67, 75, "make-believe" in, 205-209, number of, 67-70, 76
 Pleasure, 88, 103, 113
Porteus Maze Test, 229
 Practice, changes during, 361-371, direct, of "whole" process, 354-357, 370, 372, 385-386, distribution of, 349, 366, 372, 393-394; formal exercises, 354, 355, 372
 Precision, 361-362, 365
 Prehension, 27, 54

- Prejudice, 152, 163, 203-205, 218
- Prestige, 149, 153, 160, 163
- Problem solving, 236-237, 299-301, 317, 333, 344
- Prognosis tests; *see* Aptitudes, measurement
- Promotion, 397
- Proximo-distal sequence, in development, 22, 41, 73
- Punishment, influence of, 328, 400-404, reproof as, 107-109
- Purposes, 331; *see* Goals
- Quarrels, 148
- Quotient, *see* Intelligence quotient
- Radio programs, 207-211, 216
- Reaction pattern, 357
- Readiness, principles of, 278, 281, 282, 290, 303-306, 370, tests of, 279-280, 289
- Reading, 235, 258, 263, 285, 350, disability, 351, 358, 395, for vicarious experience, 206-212, 216, instruction in, 305, 312, 351-352, 358; tests of, 279-280
- Reading versus recitation, 389-392
- Reasoning, 172, 193-205, 216, 236
- Recall, 411, 416, *see* Retention
- Recitation, in learning, 389-392
- Recreation program, 63-64
- "Referents," *see* Symbols, Meanings
- Regression, in child development, 37-38, 43
- Rejection, of child, 110
- Relationships, in learning, 340-341, 344
- Reliability, of tests, 245-246
- Remedial treatment, *see* Treatment
- Resemblances among relatives, 238-243
- Resistant behavior, *see* Negativism, Aggression
- Response, 324-327, 358-359, 406
- Results, 360, of education, 410
- Retention, 390, 391, 404-417, *see* Memory
- Retroactive inhibition, 412-417
- Reversion, *see* Regression
- Revised Stanford-Binet Scale*, 227, 256
- Reward, 151, 400-404
- Rogers Physical Capacity Tests*, 275
- Satisfying effects, 103-106, 270, 327-328, 401
- Schools, function of, 298-299; influence of, 247-248, 336, of psychology, 11-16; progressive, 172, 200
- Seashore Musical Talents Test*, 272-273
- Selection, and motives, 314-315, by interests, 110, 141-142, 204-205, in learning process, 324, 326-329, 342, of subject matter, 387-389
- Sensations, 19-20, 172, 175-180, 215, 359
- Sensory, acuity, 177, 215
- Sex, development of sex interests, 126. differences, 60-61, urges, 312
- Siblings, 240-241
- Singing, training in, 35, 355, 363, 393
- Skills, acquisition of, 28-29, 42, 95, 162, 306, 341, 349-376, and educational program, 70-71, 156-157, aptitude for, 42, 75, readaptation of, during growth, 30-31, 55-56, specialized, 61, 63, 156; *see* Motor development, Learning
- Social, adaptability and intelligence, 36, 131, 267-268, 270, 281, adjustment, 72, 75, 128-130, 135-138, 191, 268-270, approval, 73, 312, behavior, 36, 42, 66-73, 122-171, 176, 186, capacity, 275, demands, 297, effect of educational procedures, 155-159, orientation, 197-205, relationships, 87, 104, 124, 145, 297
- Social studies, 197-205, 218, 313, 388
- Special abilities and aptitudes, 270-282, 288-289
- Speech, 191-192
- Spelling, 258, 263
- Standardized tests, 228, *see* Diagnostic inventory or test
- Stanford-Binet Scale*, 227, 230, 233, 235-236, 263, 265, *see* *Revised Stanford-Binet Scale*
- Statistical studies, of intelligence, 234-235, of resemblances, 238-243
- Stenquist Mechanical Aptitude Tests*, 274
- Stimulus patterns, 336-337
- Stimulus-response psychology; *see* Connectionism

- Structure, 411; *see* Pattern, Organization, Configuration
- Subject curriculum, 388-389, 394
- Subjects, school, retention of, 407-409
- Success, 153-154, 394-400
- Symbols, 85, 173-174, 215, 266, 349
- Sympathy, 139-142, 162, 297
- Systems of psychology, *see* Schools of psychology
- Teachers, and pupils, 317, 330, aptitude test for, 276-277, function of, 285, 287, 298, influence of, 105, 246-249
- Temper tantrums, 85
- Tension, 395
- Terman Group Intelligence Test*, 278
- Test construction, *see* Measurement
- Thinking, 333
- Training, *see* Learning, Guidance, Transfer
- Transfer of training, as criterion of insight, 332
- Treatment, remedial reading, 359
- Trial and error, in learning, 193, 301, 325, 354
- Tuition, verbal methods of, 362-363, *see* Guidance
- Twins, 30, 168, 189-190, 240-241
- Typewriting, 350, 356, 364-365, 367, 393
- Understanding, and retention, 409-411, of principles, 410-411, verbal, 382-383, *see* Meanings
- Urges, human, 312, *see* Needs
- Verbal ability, 263, 349, acquisition of, 377-423, *see* Language
- Vision, 281, 291, of adults, 179-180, of newborn, 19, 173
- Visual aids, in teaching, 295
- Vocabulary, development of, 186-187, 263-266, of educational psychology, 13-14
- Vocational guidance, 107, 399, use of tests in, 276-277, 286
- Vocational success and intelligence, 263-267
- Wants, *see* Needs
- Weight, growth in, 48
- "Whole-heartedness and gradation," principle of, 38-40, 43, 85, 114
- Whole versus part methods, 380-386
- Withdrawal, 395

